# Move people or move the plant?
# Business travel and relocation choices of firms

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*To my family*

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## Contents

Introduction…..……1

1. Chapter 1 ..... 13

1.1 Introduction ..... 15

1.2 Theoretical framework and hypothesis ..... 18

1.3 The survey ..... 22

1.4 The empirical model ..... 24

1.5 Results and discussion ..... 29

1.6 Conclusions ..... 35

Appendix A. Estimation results of Pooled OLS model. ..... 37

References ..... 38

2. Chapter 2 ..... 43

2.1 Introduction ..... 45

2.2 Theoretical framework ..... 47

2.3 The survey ..... 50

2.4 The empirical model ..... 51

2.5 Results and discussion ..... 56

2.6 Conclusions ..... 60

Appendix B. Estimation results of Pooled OLS model. ..... 62

References ..... 63

3. Chapter 3 ..... 69

3.1 Introduction ..... 71

3.2 Literature review ..... 73
3.3 Data ..... 75
3.4 Empirical strategy ..... 80
3.5 Results and discussion ..... 83
3.6 Conclusions ..... 88
References ..... 89
4. Conclusions ..... 97

## List of Figures

Figure 1.1 - Marginal costs for face-to-face and telecommunication meetings ..... 20
Figure 3.1- Metropolitan areas in Poland. Source: KIPPiM based on Smętkowski et al. (2008) ..... 76
Figure 3.2 - Frequency of external relocation in 2008 depending on firm age ..... 85

## List of Tables

Table 1.1 - Sample descriptives ..... 24
Table 1.2 - Frequency of the propensity to increase BT to Zurich thanks to AlpTransit (%) ..... 25
Table 1.3 - Explanatory variables ..... 27
Table 1.4 - Estimation results of the empirical models ..... 31
Table 1.5 - Direct and indirect effects. Marginal effects for y = 5 ..... 32
Table 1.6 - Marginal effects (selected results) ..... 33
Table 2.1 - Sample descriptives ..... 51
Table 2.2 - Frequency of the propensity to move (%) ..... 52
Table 2.3 - Explanatory variables ..... 55
Table 2.4 - Results of the ordered logit models ..... 58
Table 2.5 - Comparison with the actual behaviour of firms in the sample ..... 59
Table 3.1 - Sample descriptives ..... 77
Table 3.2 - Descriptive statistics of the municipalities ..... 79
Table 3.3 - Estimation of utility parameters ..... 84

# Introduction

Examining the economic behaviour of firms is one of the main tasks of microeconomists. The economic structure of regions and countries and the ability to create wealth and well-being depend, among others, on the individual choices of firms.

This issue is, at the same time, an interesting and a complex challenge. Indeed, a multiplicity of factors can influence business decisions and the evolving economic conditions make the process dynamic. It is particularly relevant to understand and predict how firms respond to changes in the environment where they operate, such as building of new infrastructures, implementation of specific economic policy measures, etc.

Every business activity takes place at a particular location, and the nature and behaviour of the firm partially depends on its location. Business performance, therefore, is partly influenced by geography (McCann 2001).

Acknowledging that geography plays a role in determining economic choices, the thesis investigates firms' location related behaviour within the framework of regional economics. Two main issues are addressed: business travel plans and relocation choices of firms.

More specifically, the purpose of the thesis is to enrich the current discussion on firms' strategic decisions by: 1) analysing how improvements in the accessibility conditions influence firms' business travels (in particular, business-to-business one-day trips); 2) investigating the firms' relocation decisions across different scenarios; and 3) disentangling the role of relocation factors related to location and firm characteristics, in the destination choice of firms. These issues are analysed by using discrete choice methods; in particular, non-linear models like nested logit models and ordered logit models are applied.

In a changing world where investments, trade and technology follow new emerging global trends, doing business has become more and more complex. Business travel (BT) and relocation decisions are two crucial features of the strategic behaviour of firms.

Business visits are work-related trips to an irregular place of work, lasting less than 12 months (Aguilera 2008). These kinds of trips have continuously grown in number,

despite the increasing availability of other forms of distance communication, such as video conferencing (Choo et al. 2007). Indeed, in an increasingly interconnected and globalised world, business travel appears to be crucial for creating synergies among spatially scattered firms, such as new opportunities for acquiring contracts, improving global corporate productivity, attracting new clients and increasing profits, sales, partnerships and innovation (Beaverstock et al. 2009; Machikita and Ueki 2010; Gustafson 2012).

Previous studies provide evidence on the economic impacts of business travel. In particular, Poole (2010) demonstrates that business visits positively influence the extensive export margin, thereby helping to overcome informational asymmetries in international trade. Concerning innovation, Hovhannisyan and Keller (2015) show that BT has a significant effect beyond technology transfer, and leads to an increase in patenting. Moreover, the work of Cristea (2011) provides ample evidence on business travel as an effective way of transferring knowledge, conserving long-term relationships, coordinating and monitoring, all of which have a direct impact on trade and offshoring activities.

With the increasing diffusion of new infrastructure building, in recent decades we have observed a growth in the number of studies investigating the effects of accessibility improvements on firms' choices. In particular, much has been written about the impact of high-speed trains (HST). For example, thanks to HST isolated markets have been better integrated, monopolistic positions have been reduced and competition and productivity have increased (Blum et al. 1997). Moreover, on an aggregate level, there is an open debate on the HST impact on GDP (Banister and Thurstain-Goodwin 2011) and on regional development (Vickerman et al. 1999; Gutiérrez 2001). Ureña et al. (2009) also highlighted that this type of infrastructure will create new opportunities by offering additional locational advantages for economic activities and commuting/business trips, thus changing the traditional city roles.

According to Gutiérrez (2001) HST improves accessibility to cities by shortening travel time, and in particular, considering the definition of inbound/outbound accessibility (Törnqvist 1984), increases the face-to-face contact opportunities during a one-day trip, especially business-to-business trips (Blum et al. 1997; Willingers et al. 2007). The relevant literature underlines that accessibility is fundamental for the decisions which a

company takes and for its performance. In this sense, high-speed trains create not only possibilities of more face-to-face contacts with other enterprises, but also with customers, suppliers, partners and the workforce (Blum et al. 1997; Bruinsma and Rietveld 1998).

Looking at some European case studies, we can generally find an ex-post positive impact of high-speed trains on BT. In the Lille-Paris line, thanks to the new TGV, 1/3 of all business travel has increased in both directions (Vickerman and Ulied 2009). This is also true for the Lyon-Paris line, where there is a face-to-face contact growth in both directions, principally due to the activities between the subsidiary offices and the headquarters (Harman 2006). In general, many intermediate cities that are between two or more metropolitan areas - for example Lille, Cordoba, Zaragoza and Lyon - take numerous advantages of the building of new high-speed infrastructures, thereby experiencing a flourishing development of their service sector (Ureña et al. 2009).

Taking into account this strand of the literature, the first chapter of the thesis investigates the potential impact on business travel of the new high-speed railway line project, called AlpTransit, which will link Lugano, the small economic hub of the southern part of Switzerland, with Zurich, one of the major Swiss economic centres, situated north of the Alps. Thanks to this infrastructure, travel time between the two cities will decrease considerably from about three hours to less than two hours by the end of 2020. Our curiosity more specifically regards the potential impact (ex-ante evaluation) of the change in travel time on the propensity to travel of employees with different functions in various types of firms.

Using on-line survey data, collected among firms located in Ticino, the Swiss Canton that includes Lugano, we show that internal firm characteristics, such as sector, frequency and destination of current business visits, significantly influence the propensity to travel to Zurich more often in the future thanks to AlpTransit.

The second issue investigated in the thesis is the relocation of economic activities. Firm relocation could be defined as a particular form of locational adjustment to changes in markets, environmental regulations and technological progress (Pellenbarg et al. 2002). Brouwer et al. (2004) distinguished between two forms of relocation: complete and partial migration. The first one implies the movement of an establishment from address A to

address B, while the partial relocation consists of setting up a new local unit, linked to the pre-existing one.

In the past, many studies have concentrated on the second type of relocation, the so-called partial relocation, and in particular on the delocalisation of business activities at international level (Crozet et al. 2004; Pfistera and Deffains 2005; Lu et al. 2014). The literature identifies various types of Foreign Direct Investments (FDI) and observes that the move of production to other countries was mainly driven by low wages and cost considerations. However, thanks to technological evolution driven by digitalisation and industry 4.0, in the last couple of years this delocalisation tendency is inverting, generating the so-called reshoring phenomenon (Ellram et al. 2013; Tate 2014).

Firm complete relocation at the local/regional level is less frequently debated. However, the lowest spatial scale is particularly interesting in terms of different development among regions and in terms of real effects on local communities, having wide implications for regional planning policy (Brouwer et al. 2004). For example, if a firm with more than 300 employees decides to completely relocate elsewhere, the GDP of the region will diminish and there will be consequences on the local labour market.

Given that relocation is a costly process, why should the firm decide to completely move its plant? Firms constantly monitor market competitiveness and compare their location with others. Therefore, the location choice can be seen as a dynamic and continuous process of optimisation, which could also imply relocation at a certain point in time. In particular, the relocation choice can be a consequence of changes in the institutional framework, which make the current location of the firm less attractive and convenient. The second chapter of the thesis is dedicated to studying how the relocation propensity of firms changes across different scenarios, considering two shocks that modify the institutional setting. Specifically, we study the influence of company and territory characteristics on firms' propensity to leave their current location in the near future. This propensity to relocate is analysed under different hypothetical scenarios using on-line survey data, collected among firms located in Ticino.

As the recent examples of Brexit (UK) and Catalonia (Spain) have shown, relocation of firms after changes in the institutional framework has become a relevant topic

in the current discussion. Indeed, the United Kingdom's decision to leave the European Union and the risk of secession of Catalonia from Spain have pushed some firms and international company groups to leave these regions, due to the uncertainty created by these events.

Events influencing the institutional framework in which firms operate can potentially occur everywhere. We consider the case of Switzerland, which is heavily dependent on European Union decisions and policies, although it is a non-member country. In particular, we analyse firms' propensity to relocate out of Ticino within the next five years, and we study whether and how this probability changes in the case that a strong appreciation of the Swiss Franc (CHF) occurs, or in the case that there are changes in the bilateral agreements between Switzerland and the European Union (EU), introducing considerable restrictions to the free movement of people and goods.

Results show that firms having local interests (i.e. clients and suppliers) have a lower propensity for moving. On the other hand, branches and headquarters, if compared to sole-proprietorships, show a higher propensity toward relocating. Finally, we find that evaluations of firms differ among scenarios.

The third chapter of the thesis analyses another aspect of the relocation phenomenon, considering the Polish metropolitan areas case study. Indeed, locational preferences and relocation propensity depend on the characteristics of the firm and on its position in the "life cycle". In particular, we investigate the influence of some driving factors on destination choice for relocating firms within five metropolitan areas (i.e. Lodz, Poznan, Krakow, Warsaw and Wroclaw) and we study the preferences of firms having different characteristics.

A nested logit model is applied, but the composition of the firm's choice set cannot be taken for granted. As in previous studies on residential location choice (for example, Kim et al. 2005) or in route choice (among others see Frejinger et al. 2009), the large number of potential alternatives to be included in the choice set makes the estimation procedure computationally unfeasible and behaviourally unrealistic (Lee and Waddell 2010). We therefore consider a (random) sample of alternatives for model estimation,

correcting the potential selection bias in the estimates by introducing additional parameters, as suggested by Bierlaire et al. (2008).

Results underline the role of age in determining relocation decisions. In particular, older firms show a lower propensity for moving, while the location change can represent an opportunity for young firms to grow, evolve and survive, in the challenging phase of first years of business life.

We verify that selection bias does not represent a problem in the analysis.

As described above, the thesis analyses business travel plans and relocation decisions by considering firms located within agglomerations/metropolitan areas. The relevance of these geographical and economic units is confirmed by the large amount of studies in the regional economics literature dedicated to investigating agglomeration economies and their effects on innovation, productivity and internationalisation of firms (among others, see the meta-analysis by De Groot et al. 2016 and Beaudry and Schiffauerova 2009).

The first chapter investigates how face-to-face business contacts among firms, which belong to different agglomerations, change when accessibility conditions improve. Indeed, a reduction in travel time can contribute to the rise of agglomeration economies by causing spatial densification near the infrastructure network nodes (Chatman and Noland 2011), and/or can boost the synergies among existing agglomerations by improving connectivity among firms and households. The second and the third chapters focus on relocation of economic activities within and among agglomerations.

The case studies analysed through the thesis take place in two territorial entities: Ticino, a small Swiss canton, and Poland. Concerning location choices of firms and destination decisions of relocating companies, Poland represents a particular example, which deserves to be studied. Since 1990, when the “shock therapy” programme was introduced in order to start the economic liberalisation process, Poland’s economy has quickly grown, with a peak in the GDP growth rate of 7% in 1995 and in 2007. Moreover, since 2004, when Poland joined the European Union as a full member, it has attracted thousands of companies from other European countries, in particular from Germany. This dynamic business climate makes Poland an interesting case study of location and

relocation of companies (Dej 2015). We focus our attention on metropolitan areas, since the economic processes have the greatest intensity in this type of geographical entity and there is a high concentration of companies. Moreover, these areas are characterised by a high potential for innovation, and play the role of strategic nodes, attracting both foreign and local investments.

Ticino represents an interesting case study too: although it is a small region, it is situated in the centre of Europe and it takes advantage of being a border territory (it adjoins Italy) in terms of labour market and availability of skilled workforce. Regarding our analysis on business travel, Ticino represents a particular example, since it is involved in one of the most important Swiss infrastructural projects in recent years, AlpTransit, which will influence the business relations between the north and the south of the Alps. At the same time, Ticino represents an attractive location for firms, which takes advantage of both the favourable Swiss institutional context and the proximity to Italy. Therefore, it is interesting to understand if and how a monetary policy shock or a change in foreign policy can influence the location/relocation choices of local firms.

The empirical contributions of the thesis are based on both revealed preference data (RP) and stated preference data (SP). Each type of data has numerous advantages, which are well known in the literature (Ben Akiva and Lerman 1985). In particular, RP data are suitable for analysing the current market behaviour of individuals/firms, while SP data allow the researcher to take into account non-existing alternatives and study choices under hypothetical scenarios. The combined use of these types of data in the thesis enables a multi-faceted view of the examined phenomena.

The thesis is organised as follows: the next chapter is dedicated to the analysis of business travel changes after the improvement in the accessibility conditions due to AlpTransit. The second chapter focuses on firms' relocation decisions across different scenarios, while the third chapter analyses the role of relocation factors in the destination choice of Polish firms. Finally, a conclusion paragraph draws results and conclusions of the dissertation.

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# Chapter 1

## Business travel decisions and high-speed trains: an ordered logit approach

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## Abstract

This chapter studies the potential impact on business travel of the new high-speed railway line project, called AlpTransit, which will link Lugano, the small economic hub of the southern part of Switzerland, with Zurich, one of the major Swiss economic centres, situated north of the Alps. Thanks to this infrastructure, travel time between the two cities will decrease considerably from about three hours to less than two hours by the end of 2020.

The question that we pose in this chapter is what impact high-speed trains could have, in the short to medium term, on business travel between the two hubs (ex-ante evaluation). Indeed, given the travel time, firms could increase their business-to-business one-day trips, boosting face-to-face interactions within and among enterprises. Our curiosity more specifically regards the potential impact of the change in travel time on the propensity to travel of employees with different functions in various types of firms.

An on-line survey was conducted among firms located in Ticino, the Swiss Canton that includes Lugano. The data are analysed using four ordered logit models, one for each employee category (CEO, administrative staff, sales personnel, specialists), since hierarchical position and professional status influence business travel characteristics. Results show that internal firm characteristics, such as sector, frequency and destination of current business travels significantly influence the propensity to travel to Zurich more often thanks to AlpTransit.



**JEL classification:** D22, R40

**Keywords:** High-speed train, business travel, ordered logit, firm behaviour.

## 1.1 Introduction

One of the persistent analytical issues in the economic geography of transport relates to the assessment of the contribution that transport infrastructure makes to the economy.

The majority of the literature analyses transport impact on regional development (Gutiérrez 2001; Marti et al. 2007) and companies' relocation strategies (Leitham et al. 2000; Kawamura 2004; De Bok and Sanders 2005), and therefore also the long run effects. However, by reducing travel time, a new infrastructure also has various impacts in the short and medium term, in particular on daily choices of firms. Nowadays, doing business means facing the increasing interconnection and globalisation of our world. In this context, business travel (BT) has become a quite common and diffuse practice (Swarbrooke and Horner 2001; Aguilera 2008; UNWTO 2012), and an essential feature of the globalised trends like outsourcing, spatial specialisation, multi-plant companies, as well as closeness to markets demand for skills.

Business visits are work-related trips to an irregular place of work, lasting less than 12 months (Aguilera 2008). These kinds of trips have continuously grown in number, despite the increasing availability of other forms of distance communication, such as video conferencing (Choo et al. 2007). Moreover, BT expands the market potential of firms, creating new opportunities for acquiring contracts (Blum et al. 1997; Jones 2007) and improves global corporate productivity, facilitates the creation of new jobs, attracts new clients and increases profits, sales, partnerships and innovation (Beaverstock et al. 2009; Machikita and Ueki 2010; WTTC 2011; Gustafson 2012). Two recent econometric studies provide evidence on the impacts of business travel. Poole (2010) demonstrates that business travel has a positive impact on the extensive export margin, thereby helping to overcome informational asymmetries in international trade. Concerning innovation, Hovhannisyan and Keller (2015) show that BT has a significant effect beyond technology transfer, and in particular, leads to an increase in patenting. Literature thus provides ample evidence on business travel as an effective way of transferring knowledge, conserving long-term relationships, coordinating and monitoring, all of which have a direct impact on trade and offshoring activities (HBR 2009; Cristea 2011).

Another strand of literature related more closely to our topic concerns accessibility improvements caused by the introduction of high-speed train connections. In the economic literature, a lot has been written about the impact of high-speed trains (HST); for example, thanks to HST isolated markets have been better integrated, monopolistic positions have been reduced and competition and productivity have increased (Blum et al. 1997). Moreover, there is an open debate on the HST impact on GDP (Banister and Thurstain-Goodwin 2011) and on regional development (Vickerman et al. 1999; Gutiérrez 2001). It has also been highlighted that this type of infrastructure will create new opportunities by offering additional locational advantages for economic activities and commuting/business trips, thus changing the traditional city roles (Ureña et al. 2009).

Looking at some European experiences, we can generally find an ex-post positive impact of high-speed trains on BT. In the Lille-Paris line, thanks to the new TGV, business travel has increased by 1/3 in both directions (Vickerman and Ulied 2009). This is also true for the Lyon-Paris line, where there is a face-to-face contact growth in both directions, principally due to the activities between the subsidiary offices and the headquarters (Harman 2006). In general, many intermediate cities that are between two or more metropolitan areas -for example Lille, Cordoba, Zaragoza and Lyon- take numerous advantages of the building of new high-speed infrastructures, thereby experiencing a flourishing development of their service sector (Ureña et al. 2009). Moreover, HST positively influences the city's position in the European urban hierarchy, empowering both dominant cities, i.e. those with the highest rank-order, and intermediate cities (McCann 2001; Mazzeo 2012). This urban structure replicates the Swiss situation well: thanks to high-speed trains, Lugano, a small intermediate city, will be closer to Zurich, a dominant economic pole.

The impacts of transport improvements on business travel on a micro level, which are the focus of this chapter, have found less attention in research. According to Gutiérrez (2001) HST improves accessibility to cities by shortening travel time, and in particular, according to the definition of inbound/outbound accessibility (Törnqvist 1984), increases the face-to-face contact opportunities during a one-day trip, especially business-to-business trips (Blum et al. 1997; Willingers et al. 2007). The relevant literature underlines

that accessibility is fundamental for the decisions which a company takes and for its performance. In this sense, high-speed trains create not only possibilities of more face-to-face contacts with other enterprises, but also with customers, suppliers, partners and workforce (Blum et al. 1997; Bruinsma and Rietveld 1998). The greater part of these studies are just qualitative analyses, with no econometric measurements of the relationship between the increase in business travel and HST and have ambiguous results (Blum et al. 1997; Kobayashi and Okumura 1997; Harman 2006; Willingers et al. 2007). This is probably due to the scarce availability of micro data directly collected from firms.

A different strand of literature can contribute to the argument made in this chapter given its interest in the value of travel time savings in general and more specifically in business travel. Wardman et al. (2013) in a report commissioned by the UK Department for Transport provide a comprehensive overview on methods and empirical evidence on the evaluation of travel time savings for business travellers. For Switzerland, Axhausen et al. (2006) estimate distance and income dependent values of travel time savings for various trip purposes and find a value of 30 CHF/hour for business travel. We will draw partly on this literature in our theoretical considerations below.

Concerning the rationale for increasing business travel as a reaction to a reduced travel time, we will draw on earlier work by one of the authors (Maggi 1989; Button et al. 1993; Button and Maggi 1995). This work treats the issue from the perspective of choice between traveling for a face-to-face meeting and telecommunication contacts. The basic rationale behind is on the one hand the superiority of face-to-face communication in terms of the quality of interaction, as we will demonstrate below, and the difference in transport cost, on the other.

Our empirical work focuses on Ticino firms' propensity of increasing future business travel, thanks to an improvement in accessibility. More concretely it regards the influence on one-day business-to-business trips of the new high-speed railway line project, called AlpTransit, which will link Lugano, a small Swiss city in the south, with Zurich, the Swiss economic capital situated north of the Alps. This infrastructure is an ambitious railway project: its first and main segment (Gotthard base tunnel) has been opened in late 2016 (note that our survey was implemented in 2014), and the Monte Ceneri base tunnel

will complete the North-South link by 2020. Thanks to the new high-speed railway line, the reduction in travel time will be very significant: from three hours to less than two between the cities of Zurich and Lugano. Swiss population, and in particular firms' managers, are aware of this project, thanks to the large advertising campaign that has been realized.

The present chapter is organised as follows: the next section is dedicated to the description of theoretical framework and hypothesis. The following two parts concern the survey and the empirical model. The fifth section highlights the main results and a brief discussion of them. Finally, some conclusions and future research ideas are presented.

## 1.2 Theoretical framework and hypothesis

Business travel is an essential ingredient of a company's activity in a context of globalisation, specialisation and spatial distribution of activities. Every firm interacts with its internal and external network of clients, suppliers etc. through a certain number of contacts. These contacts can take either the form of face-to-face meetings or any kind of telecommunication interaction. As we do not want to delve into the complexities of determining the optimal number of business trips in a dynamic context of business development, we assume the number of business trips between a given origin-destination pair to be fixed for a company, equal to $\bar{M}$. The rationale behind our conjecture of an increasing number of business trips in reaction to a decrease in travel time can thus be illustrated as a decision on the respective number of face-to-face contacts involving business trips as compared to telecommunication interactions. Following Maggi (1989), we model this decision as a simple cost-minimisation strategy. We will use the term "meetings" for contacts, where $M_{ff}$ are face-to-face meetings and $M_{tc}$ telecommunication meetings. These meetings will in reality take many forms, concern various contents, and convey messages with different degrees of complexity, as their content can range from negotiations on the same side or across the market to simple internal briefings among departments of the same company.

We develop our argument defining the cost curves for face-to-face and telecommunication meetings, respectively. The differences in cost between the two modes regard on the one hand the presence of travel time cost ($T_{travel}$) and monetary travel cost ($C_{travel}$) only for face-to-face contacts, and on the other the cost dependence on complexity of content, only for telecommunication. The two cost functions are:

$$C_{ff} = VoT \times \left(T_{travel} + T_{meeting}\right)M + C_{travel} \times M \quad (1.1)$$

$$C_{tc} = VoT \times T_{meeting} \times M^{c} \quad \text{with c} \in ]1, 10] \quad (1.2)$$

Where:
- $C_{ff}$: Cost for face-to-face meetings
- $C_{tc}$: Cost for telecommunication meetings
- VoT: Value of time
- $T_{travel}$: Travel time
- $T_{meeting}$: Meeting time
- $C_{travel}$: Monetary travel cost
- M: Number of meetings
- c: Index indicating complexity of content

The intuition behind the formulation of the cost function for telecommunication is simply that the marginal cost of transmitting increasingly complex contents over a telecommunication mode is increasing. The index c indicates the complexity of content and we assume it can take any value from one (excluded) to ten. Standardising for simplicity meeting time to one ($T_{meeting}$= 1), cost-minimisation optimal choice implies that the marginal costs of the two types of meetings are equal $MC_{ff} = MC_{tc}$, where:

$$MC_{ff} = VoT \times (T_{travel} + 1) + C_{travel} \quad (1.3)$$

$$MC_{tc} = VoT \times c \times M^{c-1} \quad (1.4)$$

Figure 1.1 illustrates our argument with the meetings ordered by increasing complexity from left to right on the horizontal axis, and marginal costs on the vertical axis. To illustrate the point, in this figure we assume that the index indicating complexity of content is equal to two (c=2).

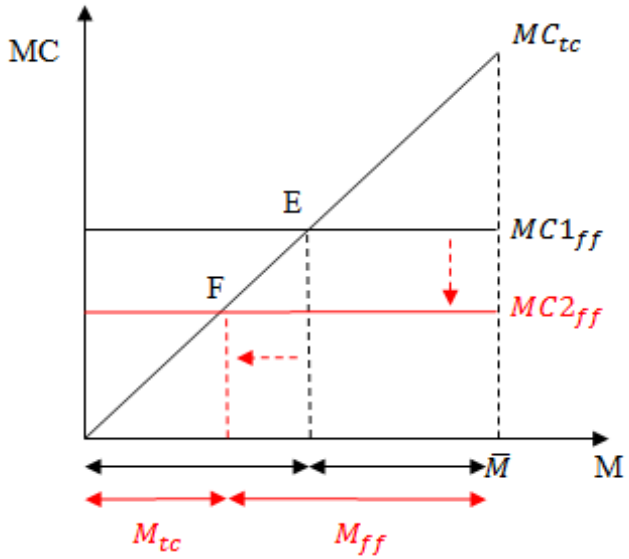


Figure 1.1 - Marginal costs for face-to-face and telecommunication meetings

The total number of meetings $\bar{M}$ is distributed between a certain number of face-to-face meetings and telecommunication interactions. When a decrease in travel time occurs, the line of the marginal cost for face-to-face contacts moves down (Fig. 1.1 in red) and provokes a substitution of some of the telecommunication meetings of a certain complexity with face-to-face meetings. This substitution effect is realistic, given the experience that face-to-face contacts are the norm for very small local distances and in-house meetings. Note we do not consider a variation in the monetary travel cost. While in general it can be assumed that prices might increase if the stakeholders of an infrastructure project want to recover their investment, this is not the case of the entirely publicly funded AlpTransit project. In Switzerland, the ticket prices of public transports are only distance dependent and, in order to improve accessibility, the standard policy is to invest in a new infrastructure, without adjusting prices.

Overall, according to these theoretical considerations, we expect that AlpTransit will have a positive impact on business trips, since it will reduce travel times. Apart from travel time, our simple model does not provide indications for the specification of our empirical model. We therefore rely on the empirical literature described below.

As the literature suggests, the variables influencing business travel behaviour can be grouped into characteristics of firms and current business relations features.

Previous studies underline the influence of sector on the perception of the importance of accessibility. In particular, the empirical evidence shows that in the tertiary sector, e.g. business services and R&D, face-to-face contacts are essential for the success of the activities (Blum et al. 1997; Jones 2007; Aguilera 2008). For this reason, the business services sector is the one that could benefit more from HST (Harman 2006). While a firm's size is a determinant for the perception of accessibility, we have not found any evidence supporting the hypothesis that the age of a firm significantly influences travel behaviour.

Another important determinant is the firm's spatial organisational structure, in terms of subsidiaries, branches and headquarters. In this context, business travel is essential to tying together spatially distributed subsidiaries (Aguilera 2008; Beaverstock et al. 2009).

Concerning current business relations, interactions with clients and suppliers are one of the main causes of face-to-face contacts (Aguilera 2008; Beaverstock et al. 2009; Cristea 2011). According to a survey by the Harvard Business Review, more than 89% of review subscribers agree that face-to-face contacts are essential for "sealing a deal".

The destination of current business trips and the means of transport used can also influence the future behaviour (indeed, travel behaviour is based on habits, see Aarts et al. 1998; Aarts and Dijksterhuis 2000). We can imagine that firms, which nowadays have partners in a specific destination and visit them, will be the first that will take advantage of a new faster infrastructure.

While most of the past studies are ex-post evaluations of the impact of an infrastructure, the aim of this chapter is to offer an ex-ante evaluation of the AlpTransit project, using individual firm level data. In order to do this, we rely on the stated preference methods, which allow taking into account hypothetical behaviours in the future.

In particular, the goals of this work are to investigate if and how high-speed trains could change firms' business relations between a small city (Lugano) and a dominant one (Zurich), which have similar economic structures (they are both specialised in business

services, in particular financial activities). Second, to understand if significant reduction in travel time will have a differentiated influence on some specific firms (do firm's characteristics matter?). Finally, to identify the link between firms' characteristics and future business trips within various employee categories.

In order to achieve these goals the probability that face-to-face contacts will increase after AlpTransit is analysed by distinguishing employee categories: CEO and upper management, administrative staff, sales personnel and specialists. This specification helps in identifying the probable meeting purpose, for example visiting clients, branches, government departments or attending courses, fairs, conferences and conventions, opening or closing new units, projects, R&D, etc. (Swarbrooke and Horner 2001; Welch and Worm 2005; Beaverstock et al. 2009). Indeed, strategic decisions "travel" with the CEO and upper management (Jones 2007) and the areas where face-to-face contacts are fundamental for the success of companies are sales and business development (HBR 2009). This specification is also motivated by the fact that not all workers travel: professional status and hierarchical position are significant factors, which influence the business travel characteristics (Aguilera 2008).

## 1.3 The survey

The data were collected with an online survey among Ticino firms in 2014. The questionnaire was explicitly addressed to the CEO/upper management of the firm.

A sample of 5890 firms was randomly selected from the Bureau van Dijk business listing, reflecting sectorial composition of Ticino economy (70% of the sampled businesses are in tertiary sector).

The overall response rate was 13% in line with previous studies using questionnaires with firms (Kawamura 2004; Targa et al. 2006). From the 773 questionnaires filled in, we exclude incomplete questionnaires and all firms with zero employees (which are mainly foreign branches with only legal residence in Ticino), since they are not relevant for the purposes of our analysis. Therefore, 696 firms are considered in the model.

The survey was built following the most recent examples in the literature and could be divided into four main sections. The first one aims to collect general information about the enterprise: sector, age, spatial organisation (head office and branches), size, as well as information on relevant geographic markets (where suppliers and customers are located). In the second section, firms are asked to rate the importance and presence in Ticino of some location factors, such as accessibility, cost of labour, business taxes, etc.

The third part is devoted to business relations, in particular to understanding frequency, destination and means of transport used for business trips, with a focus on trips to Zurich. In the questionnaire, we specify that business visits are work-related travels to an irregular place of work, lasting less than 12 months (Aguilera 2008).

Finally, the last section contains some hypothetical questions on future actions of companies and in particular on possible relocation outside Ticino and on changes in BT due to AlpTransit.

Considering the possibility of easily reaching the train station, the geographical distribution of firms is important. The majority of firms in our sample is concentrated in the city of Lugano, which is the main economic pole of Ticino and is the financial centre of the canton. The cities of Mendrisio and Chiasso (both in the south) follow in terms of highly populated areas in the sample. This concentration in the southern part of the canton, near Lugano where AlpTransit will stop, confirms that our sample is appropriate for the analysis.

| Category | | Sample (n) | Sample (%) |
|---|---|---|---|
| **Sector** | Secondary | 192 | 27.6% |
| | Tertiary | 504 | 72.4% |
| **Age** | Less than 3 years old | 180 | 25.9% |
| | More than 4 years old | 516 | 74.1% |
| **Organizational structure** | Sole propriatorship | 546 | 78.4% |
| | Branch | 80 | 11.5% |
| | Headquarter | 70 | 10.1% |
| **Dimension** | Micro | 495 | 71.1% |
| | Small | 161 | 23.1% |
| | Medium-Large | 40 | 5.8% |

Table 1.1 - Sample descriptives

Table 1.1 shows some descriptive statistics regarding our sample: 72.4% of firms in the sample operate in the tertiary sector; they are mainly firms, which are more than four years old (74.1%) and sole proprietorships (78.4%). Moreover, about 71% of them are micro firms (with less than 10 workers). Those sample characteristics, which seem quite unbalanced, actually reflect the economic structure of Ticino, which is mainly composed of micro firms (89% of the businesses in Ticino in 2014), sole-proprietorships (87%) and operating in services (81%).

## 1.4 The empirical model

As stated above, the last part of the survey contains some hypothetical questions, formulated as Likert scales, on firms' future behaviour and in particular on possible changes in business travel due to AlpTransit. By the time of the inquiry, the project was totally defined, in particular in terms of travel times, frequencies and train stops. Therefore, we have no concerns regarding possible strategical answering by respondents.

We use the questions "How likely is it that the following employee categories (CEO, sales personnel, administrative staff and specialists) will travel more to Zurich,

thanks to AlpTransit? 1 (Not at all likely), 5 (Very likely or almost certain)" as indicators for the dependent variables in the ordered logit models.

The distribution of the propensity to increase BT to Zurich across the employee categories is shown in Table 1.2. Almost 14% of the firms in the sample claim that their CEOs will travel more to Zurich thanks to AlpTransit (considering both "likely" and "almost certain" categories). This percentage decreases for the other employee categories: respectively to 4.7% for administrative staff, to 10.4% for sales personnel and to 7.1% for specialists. Thanks to these descriptive statistics, we have preliminary evidence that the considered employee categories have a different propensity to increase their travel thanks to AlpTransit.

| | 1 – Not at all likely | 2 - Unlikely | 3 – Neither unlikely nor likely | 4 - Likely | 5 – Very likely or almost certain |
|---|---|---|---|---|---|
| Increase BT of CEO | 61.4% | 12.5% | 12.2% | 6.2% | 7.8% |
| Increase BT of administrative staff | 79.5% | 9.8% | 6% | 2.4% | 2.3% |
| Increase BT of sales personnel | 71.1% | 9.9% | 8.6% | 6.5% | 3.9% |
| Increase BT of others (specialists) | 75% | 10.5% | 7.5% | 4.2% | 2.9% |

Table 1.2 - Frequency of the propensity to increase BT to Zurich thanks to AlpTransit (%)

Ordered logit models are used when the dependent variable is ranked on a scale. In particular, they are applied in stated preference choice experiments with Likert scales (Greene and Hensher 2009; Hess and Daly 2014).

They allow an analysis of hypothetical situations: thanks to self-assessed probabilities, we could try to capture agent's behaviour in a future situation. Many applied works can be found in the literature, on various topics, for example: education (Machin and Vignoles 2005), health status (Riphahn et al. 2003), transportation (Hensher et al. 2010) and mobilisation time during a hurricane (Sadri et al. 2013). To the best of our knowledge, this work is the first attempt to apply this type of model to a potential increase in business travel due to a high-speed train project.

Following the work presented in Greene and Hensher (2009), we consider a latent variable $y^*$ that captures how AlpTransit will modify firms' business relationships. This phenomenon can be described by the following latent regression model:

$$y_i^* = \beta' x_i + \mathcal{E}_i \tag{1.5}$$

and is observed in discrete form through a censoring mechanism. In particular, our latent variable is represented by a discrete and ordinal indicator $y_i$:

$$\begin{aligned} y_i &= 1 \text{ if } \mu_0 < y_i^* < \mu_1 \\ y_i &= 2 \text{ if } \mu_1 < y_i^* < \mu_2 \\ y_i &= 3 \text{ if } \mu_2 < y_i^* < \mu_3 \\ y_i &= 4 \text{ if } \mu_3 < y_i^* < \mu_4 \\ y_i &= 5 \text{ if } \mu_4 < y_i^* < \mu_5 \end{aligned} \tag{1.6}$$

$y_i$ is the self-assessed probability of increasing BT for each employee category thanks to AlpTransit.

The sample observations (firms) are labelled $i$ = 1, ... , $n$; the vector $x_i$ contains all our explanatory variables, which are assumed to be strictly exogenous of $\mathcal{E}_i$ and are described in Table 1.3. The vector of unknown parameters $\beta$ and the $J$+1 thresholds $\mu_j$ are the object of estimation and inference.

| Variables | Operationalization | Mean | Std. Dev. |
|---|---|---|---|
| Suppliers in Ticino | How many suppliers firm has in Ticino | 1.47 | 1.05 |
| Suppliers in Italy | How many suppliers firm has in Italy | 1.33 | 0.79 |
| Suppliers in Zurich | How many suppliers firm has in Zurich | 1.208 | 0.60 |
| Suppliers in East Europe | How many suppliers firm has in East Europe | 1.057 | 0.34 |
| Suppliers in Western Europe | How many suppliers firm has in Western Europe | 1.23 | 0.66 |
| Clients in Ticino | How many clients firm has in Ticino | 3.63 | 1.35 |
| Clients in Zurich | How many clients firm has in Zurich | 1.64 | 0.94 |
| Clients in Italy | How many clients firm has in Italy | 1.82 | 1.01 |
| Clients in East Europe | How many clients firm has in East Europe | 1.27 | 0.62 |
| Clients in Western Europe | How many clients firm has in Western Europe | 1.59 | 0.95 |
| Services | Firm belongs to business services (financial and insurance activities, real estate, administrative, scientific and professional activities) - dummy variable | 0.258 | 0.44 |
| Manufacturing | Firm belongs to manufacturing sector - dummy variable | 0.124 | 0.33 |
| Other tertiary | Firm belongs to tertiary sector, business services excluded - dummy variable | 0.464 | 0.50 |
| Other secondary | Firm belongs to secondary sector, manufacturing excluded - dummy variable | 0.153 | 0.36 |
| Size | How many workers the plant in Ticino has | 16.37 | 55.37 |
| Age | How old the firm is | 21 | 26.54 |
| Sole proprietorship | Firm is a sole proprietorship - dummy variable | 0.78 | 0.41 |
| Branch | Firm is a branch of a company group - dummy variable | 0.12 | 0.32 |
| Headquarters | Firm is an headquarters of a company group - dummy variable | 0.1 | 0.30 |
| Other plant in Zurich | Firm has another plant in Zurich - dummy variable | 0.048 | 0.22 |
| CEO current BT to Ticino | Current BT frequency of CEO in Ticino | 4.23 | 1.82 |
| CEO current BT to Zurich | Current BT frequency of CEO to Zurich | 2.06 | 1.19 |
| CEO current BT to Milan | Current BT frequency of CEO to Milan | 2.13 | 1.39 |
| Admin. current BT to Ticino | Current BT frequency of administrative staff in Ticino | 2.59 | 1.86 |
| Admin. current BT to Zurich | Current BT frequency of administrative staff to Zurich | 1.32 | 0.74 |
| Admin. current BT to Milan | Current BT frequency of administrative staff to Milan | 1.29 | 0.78 |
| Comm. current BT to Ticino | Current BT frequency of sales personnel in Ticino | 3.16 | 2.03 |
| Comm. current BT to Zurich | Current BT frequency of sales personnel to Zurich | 1.69 | 1.14 |
| Comm. current BT to Milan | Current BT frequency of sales personnel to Milan | 1.71 | 1.25 |
| Other current BT to Ticino | Current BT frequency of specialists in Ticino | 2.85 | 2.08 |
| Other current BT to Zurich | Current BT frequency of specialists to Zurich | 1.45 | 0.91 |
| Other current BT to Milan | Current BT frequency of specialists to Milan | 1.43 | 0.96 |
| Current use of train to Zurich | Current use of train to go to Zurich (in percentage) | 0.14 | 0.29 |
| Current use of car to Zurich | Current use of car to go to Zurich (in percentage) | 0.29 | 0.41 |
| Overnight stay in Zurich | Current overnight stay in Zurich after a business | 0.14 | 0.35 |
| Distance | Distance in km from Alptransit station | 11.9 | 11.45 |

Table 1.3 - Explanatory variables

Following the literature, we include among the regressors the number (measured on a Likert scale from 1 to 5) and location of suppliers and customers[1], firms' characteristics: age, size, sector (in particular, manufacturing, business services, other activities in secondary and in tertiary sectors) and spatial organisation of the firm (if the firm is a branch, sole proprietorship or headquarters). In addition, we introduce frequency and destination (Milan, Ticino and Zurich) of current business travel as explanatory variables[2]. Some characteristics of current BT are taken into account such as the overnight stay in Zurich (thanks to the reduced travel time, firms could substitute them with more one-day trips) and the current use of train or car to go to the north of the Alps. In the sample, 74% of respondents declared currently using car more than 50% of the times to go to Zurich, while 33% of companies answered using the train more than half of times. Only 1% of firms indicated flight as means of transport to go to Zurich, but only occasionally. Finally, we include a variable indicating the distance in kilometres from the nearest AlpTransit station in Ticino (Lugano or Bellinzona) to take into account another element of access to HST.

We assume that the error term $\mathcal{E}_i$ is IID Logistic distributed with mean 0, scale parameter 1 and cumulative distribution function $\Lambda(\mathcal{E}_i|x_i) = \Lambda(\mathcal{E}_i)$.

Given these assumptions, the probabilities associated with the observed outcomes are:

$$Prob[\, y_i = j \mid x_i] = Prob[\mu_{j-1} < y_i^* < \mu_j] = Prob[\mu_{j-1} < \beta' x_i + \mathcal{E}_i < \mu_j] =$$
$$= Prob\,[\mathcal{E}_i < \mu_j - \beta' x_i\,] - Prob\,[\mathcal{E}_i < \mu_{j-1} - \beta' x_i] = \Lambda\,[\mu_j - \beta' x_i] - \Lambda\,[\mu_{j-1} - \beta' x_i] \qquad (1.7)$$

with $j = 0, 1, \ldots, J$.

For identification purposes, we impose that $\mu_{j-1} < \mu_j$; $\mu_0 = -\infty$ and $\mu_5 = +\infty$.

[1] We do not introduce in the estimated model the variables "Suppliers in Ticino", "Suppliers in Italy", "Suppliers and customers in Western Europe", since their coefficients were statistically insignificant across all specifications of the model.

[2] The variable "CEO current BT to Milan" is not introduced in the estimated model, since it is highly correlated with the variable "Sales personnel current BT to Milan".

The log-likelihood function, based on the previous implied probabilities, is:

$$\log L = \sum_{i=1}^{n} \sum_{j=0}^{J} m_{ij} \log [\Lambda (\mu_j - \beta' x_i) - \Lambda(\mu_{j-1} - \beta' x_i)] \quad (1.8)$$

where $m_{ij} = 1$ if $y_i = j$ and 0 otherwise. Thanks to the maximum likelihood estimator (MLE), it is possible to estimate the parameters $\beta$ and μ.

## 1.5 Results and discussion

Table 1.4 presents the results of the ordered logit models for the four employee categories. One of the main results of the analysis concerns the spatial structure of firms' current business travel. In particular, the more frequent current BT in Ticino or to Zurich for one employee category are, the higher the intention to travel more for the same category. We can call this "direct effect": AlpTransit will consolidate the travel behaviour of all these categories. It is interesting to notice that BT in Ticino and to Zurich have both positive and significant coefficients, if we look at the direct effects in all categories. This suggests that the two economies (Ticino and Zurich) are linked: not only will having current frequent business relationships with Zurich increase future travel, but also current trips within Ticino will boost such relationships.

We can also identify an "indirect effect", i.e. how current BT of one category influences the future BT of other categories. In particular, results show that the more frequently a CEO currently travels to Zurich, the higher the probability of more administrative staff also travelling. In addition, the more frequently administrative staff currently travel to Zurich, the higher the intention of increasing CEO and specialists' BT.

| **Variables** | **Ordered logit** | | | |
|---|---|---|---|---|
| | **CEO** | **Admin.** | **Comm.** | **Others** |
| Suppliers in Zurich | -0.203 | -0.043 | -0.202 | -0.071 |
| | (0.18) | (0.21) | (0.19) | (0.19) |
| Suppliers in East Europe | -0.44 | **-1.313**** | **-0.652*** | -0.62 |
| | (0.33) | **(0.57)** | **(0.39)** | (0.39) |
| Clients in Ticino | 0.117 | 0.07 | 0.054 | 0.063 |
| | (0.08) | (0.10) | (0.09) | (0.09) |
| Clients in Zurich | **0.28***** | **0.207*** | **0.325***** | 0.151 |
| | **(0.1)** | **(0.11)** | **(0.11)** | (0.11) |
| Clients in Italy | **-0.254**** | -0.093 | **-0.219*** | -0.107 |
| | **(0.11)** | (0.13) | **(0.11)** | (0.12) |
| Clients in East Europe | 0.031 | **0.321**** | -0.003 | 0.06 |
| | (0.14) | **(0.16)** | (0.16) | (0.17) |
| Manufacturing | fixed | fixed | fixed | fixed |
| Services | **1.123***** | **0.726*** | **0.732**** | **0.843**** |
| | **(0.35)** | **(0.44)** | **(0.38)** | **(0.39)** |
| Other secondary | **1.08***** | **1.081**** | **1.03***** | **0.872**** |
| | **(0.35)** | **(0.43)** | **(0.37)** | **(0.38)** |
| Other tertiary | 0.463 | 0.297 | 0.543 | 0.346 |
| | (0.33) | (0.41) | (0.35) | (0.38) |
| Size | -0.0006 | -0.002 | -0.0023 | -0.0006 |
| | (0.0013) | (0.001) | (0.002) | (0.0014) |
| Age | -0.0015 | -0.003 | 0.005 | **0.006*** |
| | (0.0033) | (0.004) | (0.003) | **(0.003)** |
| Headquarters | fixed | fixed | fixed | fixed |
| Sole proprietorship | -0.013 | 0.297 | 0.065 | -0.078 |
| | (0.28) | (0.36) | (0.30) | (0.32) |
| Branch | 0.10 | **0.868*** | 0.233 | 0.048 |
| | (0.39) | **(0.47)** | (0.41) | (0.43) |
| Other plant in Zurich | -0.224 | 0.09 | -0.22 | -0.106 |
| | (0.47) | (0.51) | (0.47) | (0.5) |

| Variables | Ordered logit | | | |
|---|---|---|---|---|
| | **CEO** | **Admin.** | **Comm.** | **Others** |
| CEO current BT to Ticino | **0.173*** ** | **-0.126*** | 0.051 | -0.0009 |
| | **(0.06)** | **(0.08)** | (0.07) | (0.07) |
| CEO current BT to Zurich | **0.37*** ** | **0.33*** ** | 0.094 | 0.138 |
| | **(0.11)** | **(0.13)** | (0.12) | (0.13) |
| Admin. current BT to Ticino | -0.001 | **0.235*** ** | 0.104 | 0.085 |
| | (0.06) | **(0.07)** | (0.06) | (0.07) |
| Admin. current BT to Zurich | **0.24*** | **0.47*** ** | 0.09 | **0.33** ** |
| | **(0.14)** | **(0.16)** | (0.15) | **(0.16)** |
| Admin. current BT to Milan | **-0.27*** | -0.013 | **-0.398** ** | **-0.573*** ** |
| | **(0.14)** | (0.16) | **(0.14)** | **(0.16)** |
| Comm. current BT to Ticino | 0.03 | 0.052 | **0.114*** | -0.013 |
| | (0.06) | (0.08) | **(0.07)** | (0.07) |
| Comm. current BT to Zurich | -0.045 | -0.0012 | **0.211*** | -0.079 |
| | (0.11) | (0.14) | **(0.13)** | (0.14) |
| Comm. current BT to Milan | -0.12 | -0.14 | **0.391*** ** | 0.101 |
| | (0.10) | (0.13) | **(0.11)** | (0.12) |
| Other current BT to Ticino | **-0.099*** | -0.048 | -0.037 | 0.088 |
| | **(0.06)** | (0.07) | (0.06) | (0.07) |
| Other current BT to Zurich | -0.085 | 0.045 | 0.071 | **0.268** ** |
| | (0.13) | (0.15) | (0.13) | **(0.14)** |
| Other current BT to Milan | **0.345*** ** | 0.092 | **0.206*** | **0.479*** ** |
| | **(0.12)** | (0.14) | **(0.12)** | **(0.13)** |
| Current use of car to Zurich | **0.51** ** | **0.609** ** | 0.349 | 0.085 |
| | **(0.25)** | **(0.31)** | (0.27) | (0.29) |
| Current use of train to Zurich | **1.67*** ** | **0.967*** ** | **1.13*** ** | **1.019*** ** |
| | **(0.31)** | **(0.36)** | **(0.32)** | **(0.34)** |
| Overnight stay in Zurich | 0.081 | 0.143 | **0.472*** | **0.49*** |
| | (0.23) | (0.28) | **(0.25)** | **(0.27)** |
| Distance km from Alptransit station | 0.003 | 0.004 | 0.007 | 0.003 |
| | (0.007) | (0.009) | (0.008) | (0.008) |
| Constant | - | - | - | - |
| Observations | 696 | 696 | 696 | 696 |
| Final Log-likelihood | -722.68 | -448.901 | -595.329 | -538.816 |
| Adjusted rho squared | 0.35 | 0.51 | 0.42 | 0.44 |

Std errors in parenthesis *** p<0.01, ** p<0.05, *p<0.1

Table 1.4 - Estimation results of the empirical models

These “indirect effects” could be explained by the fact that different categories of employees travel for different purposes (Aguilera 2008): for example, after CEOs have established a strategic contact or have signed a new contract, they may leave the concrete tasks to the operational arm (administrative staff), increasing BT of that category.

Table 1.5 presents the marginal effect for the highest value of the ordinal dependent variable (y = 5), highlighting the direct and indirect effects.

| **Variables** | **CEO** | **Admin.** | **Comm.** | **Others** |
|---|---|---|---|---|
| CEO current BT to Zurich | **0.015*** ** | **0.0032** ** | 0.0017 | 0.002 |
| Admin. current BT to Zurich | **0.009*** | **0.0045*** ** | 0.0016 | **0.0049*** |
| Comm. current BT to Zurich | -0.002 | -0.00001 | **0.0037*** | -0.001 |
| Other current BT to Zurich | -0.004 | 0.00043 | 0.0007 | **0.0039*** |

*** p<0.01, ** p<0.05, *p<0.10

Table 1.5 - Direct and indirect effects. Marginal effects for y = 5

Concerning the importance of a specific sector, being a business service enterprise (financial and insurance activities, real estate, administrative, scientific and professional activities), i.e. activities which support companies, positively influences (if compared to manufacturing) the intention to travel more with AlpTransit for all categories. This is in line with the literature; in particular, the best impact of HST is likely if the service sector is already a key economic characteristic of the region (Harman 2006), as is the case for the service sector in Ticino.

Moreover, the variable “other activities in the secondary sector” (mainly construction) is significant for all the models and has a positive sign: construction activities show a higher propensity toward increasing travel with AlpTransit (according to our data some professional profiles, like plant designers and tile layers, travel a lot).

Looking at the variables which indicate the current transport mode chosen to go to Zurich, both use of train and use of car positively affect the probability of travelling more with AlpTransit in the future. For the variable “current use of car to Zurich”, the coefficient is not statistically significant for the “sales personnel” and “specialists” model. Therefore, not only those using the train at present, but also CEOs and administrative staff using cars will travel more to Zurich thanks to high-speed trains.

In order to interpret the magnitude of the estimated coefficients for their effect on the categories of the ordinal dependent variable (i.e. on the propensity to increase BT), the marginal effects need to be computed. Table 1.6 presents a selection of the marginal effects for the last two ordinal categories of the dependent variable for the four employee groups.

| Variables | CEO | | Admin. | |
|---|---|---|---|---|
| | y = 4 | y = 5 | y = 4 | y = 5 |
| Clients in Zurich | **0.011*** ** | **0.011*** ** | **0.0025*** | **0.002*** |
| Services | **0.056*** ** | **0.061*** * | **0.011*** | **0.0078*** |
| Other secondary | **0.057*** ** | **0.064*** * | **0.019*** | **0.016*** |
| Current use of car to Zurich | **0.021*** * | **0.021*** * | **0.0074*** | **0.0058*** |
| Current use of train to Zurich | **0.069*** ** | **0.069*** ** | **0.012*** * | **0.0093*** * |

*** p<0.01, ** p<0.05, *p<0.10

| Variables | Comm. | | Others | |
|---|---|---|---|---|
| | y = 4 | y = 5 | y = 4 | y = 5 |
| Clients in Zurich | **0.013*** ** | **0.0057*** ** | 0.0038 | 0.0022 |
| Services | **0.033*** | **0.015*** | **0.026*** | **0.0156*** |
| Other secondary | **0.054*** * | **0.026*** | **0.029*** | **0.0178*** |
| Current use of car to Zurich | 0.013 | 0.006 | 0.0021 | 0.0012 |
| Current use of train to Zurich | **0.044*** ** | **0.02*** ** | **0.026*** ** | **0.0151*** ** |

*** p<0.01, ** p<0.05, *p<0.10

Table 1.6 - Marginal effects (selected results)

In general, the marginal effects are larger for the CEO model than for the other models. In particular, the likelihood of increasing CEO business travel thanks to AlpTransit (considering y=4 and y=5 together) increases by 12% on average for firms belonging to business services, all else being equal; while for the other employee categories, the same percentage is 2% for administrative staff, 4.8% for sales personnel and 4% for specialists. Concerning the current transport habits, an increase of 1% in the current use of train to go to Zurich is associated with a growth of 14% in the likelihood of boosting CEO business travel with AlpTransit. The same percentage decreases to 2% for administrative staff, 6.4% for sales personnel and 4% for specialists.

Other interesting results regard the variables related to the geographical distribution of clients and suppliers (Table 1.4). What clearly emerges is that the higher

the number of current clients in Zurich, the higher the intention to travel more to Zurich with AlpTransit (the coefficients are positive and significant for three out of four models). Therefore, AlpTransit will consolidate business relations between Ticino firms and the major Swiss economic pole, as expected. Indeed, close communication between business partners, which often implies face-to-face contacts, turns out to be essential for successful trade transactions (Cristea 2011). The results regarding suppliers require caution in the interpretation, since only a limited number of firms in the sample answered to these questions.

Being a branch positively affects the probability to travel more because of AlpTransit if compared with the reference category (being the headquarters), but only for the administrative staff model. This result could be explained by the purpose of travel, which is mainly internal training for those kinds of firms.

As far as the variable indicating the presence of other plants of the same company in Zurich is concerned, it is not significant, but this is probably due to the low number of firms with this characteristic in our sample.

The overnight stay variable is statistically significant only for the last two models and is positive: the fact that today, after a meeting, employees stay overnight in Zurich, positively influences the intention of increasing travel for sales personnel and specialists, if compared with those firms that currently do not remain overnight. We can imagine that, for these categories, which are less “eminent” in a firm, there is a sort of substitution effect: they will no longer stay overnight in Zurich, which is quite expensive, but they will have one-day trips more frequently.

Finally, in order to support our hypothesis that professional status and hierarchical position influence business travel, we estimate a Pooled OLS model with cluster standard errors. Results are shown in Appendix A. The dummy variable for CEO is taken as a reference and the variables for the other three employee categories are introduced into the model. The estimated coefficients of administrative staff, sales personnel and others (specialists) are all statistically significant and negative, meaning that there is a difference between these categories and CEO in the propensity to increase business travel after

AlpTransit. Moreover, if we test the equivalence among these three coefficients, we can reject the null hypothesis that they are equal.

## 1.6 Conclusions

As demonstrated by the literature review, relevant accessibility improvements have very complex but measurable implications on regional development. However, while these effects are empirically demonstrated on an aggregate level, implications of large infrastructure projects for individual firms have received little attention. In this research, we demonstrate that in case of a clearly defined and predictable change in services on a new infrastructure it is possible to identify future adaptation of business travel to improved accessibility.

The main goal of this chapter is to understand how the propensity of employees in various types of firms to travel between a small city and a dominant one will change after AlpTransit, the high-speed railway project in Switzerland. Using new micro data, we apply ordered logit models in order to investigate this issue. We obtain differentiated results among employees with different functions in various types of firms. Being a business services firm positively affects the probability of increasing face-to-face contacts. This result is in line with the literature: firms providing support to other companies take more advantage of high-speed trains (Blum et al. 1997; Jones 2007) and exploit the opportunities linked to an enlarged market (see the experience of Lyon companies: Harman 2006). Moreover, in this specific case, Ticino and Zurich have a common specialisation in financial, professional and scientific activities: both the localisation ratio and the specialisation ratio are quite high in both regions for those industries. We conclude that the existence of common clusters encourages the development of business relations between the two territories.

Another interesting piece of evidence from the study is that a firm's current level of business travel between Ticino and Zurich as well as an intensive travel activity in Ticino encourages future face-to-face contacts. We conclude that, in line with our theoretical considerations, BT habits influence future ones, reinforced by interaction effects among higher and lower levels of employee categories.

Overall, our results are in line with those in the ex-post evaluation literature. Therefore, we can conclude that our experiment is realistic and the ex-ante evaluation is credible. This might be due to the fact that the project considered intervenes in a context of existing strong business ties along the link, and that the future services provided in terms of time-table, frequency of service and prices were known in advance.

There are limits to the analysis of foreseen prospective impacts. Future research after the opening of the new link will have to verify our findings for Ticino and include an equivalent approach to the analysis of behaviour of Zurich firms. After all, given the "double importance" of accessibility, Ticino will also be closer for Zurich firms.

In conclusion, an ex-ante evaluation of the effects of a new infrastructure opening is possible as long as the focus is on a specific travel category (in our case business travel).

Overall, our study foresees positive impacts on future business travels due to HST, differentiating by functions of employees and current travel intensity. We therefore expect positive effects of the opening of the new connection on Ticino economy.

## Appendix A. Estimation results of Pooled OLS model.

| Variables | Pooled OLS |
|---|---|
| CEO | fixed |
| Administrative staff | **-0.481*** (0.03)** |
| Sales personnel | **-0.244*** (0.033)** |
| Others (specialists) | **-0.37*** (0.037)** |
| Suppliers in Zurich | -0.055 (0.06) |
| Suppliers in East Europe | **-0.135** (0.06)** |
| Clients in Ticino | 0.023 (0.03) |
| Clients in Zurich | **0.094** (0.05)** |
| Clients in Italy | **-0.071* (0.04)** |
| Clients in East Europe | 0.013 (0.06) |
| Manufacturing | fixed |
| Services | **0.438*** (0.11)** |
| Other secondary | **0.363*** (0.103)** |
| Other tertiary | **0.245*** (0.097)** |
| Size | **-0.0011** (0.0005)** |
| Age | 0.0001 (0.0012) |
| Headquarters | fixed |
| Sole proprietorship | 0.057 (0.10) |
| Branch | **0.244* (0.14)** |
| Other plant in Zurich | -0.113 (0.19) |
| CEO current BT to Ticino | 0.032 (0.02) |
| CEO current BT to Zurich | 0.085 (0.06) |
| Admin. current BT to Ticino | 0.026 (0.02) |
| Admin. current BT to Zurich | **0.141* (0.08)** |
| Admin. current BT to Milan | **-0.129** (0.05)** |
| Comm. current BT to Ticino | 0.014 (0.02) |
| Comm. current BT to Zurich | 0.047 (0.05) |
| Comm. current BT to Milan | 0.054 (0.03) |
| Other current BT to Ticino | -0.015 (0.02) |
| Other current BT to Zurich | 0.03 (0.06) |
| Other current BT to Milan | **0.129*** (0.05)** |
| Current use of car to Zurich | 0.08 (0.11) |
| Current use of train to Zurich | **0.581*** (0.15)** |
| Overnight stay in Zurich | 0.191 (0.12) |
| Distance km from Alptransit | 0.002 (0.003) |
| Constant | **0.651** (0.26)** |
| Observations | 2784 |
| R-squared | 0.22 |

Std errors in parenthesis *** p<0.01, ** p<0.05, *p<0.1

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# Chapter 2

## Leave or stay when conditions change? Exploring relocation propensity of firms

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## Abstract

The geographical distribution of firms is associated with high impacts on the economy at the local, regional and global levels (McCann 2001) and has wide implications for economic development policy.

This chapter seeks to contribute to the empirical literature on relocation of firms at the regional level. We focus on the influence of company and territory characteristics on firms' propensity to leave their current location in the near future. Our main purpose is to study whether and how this probability changes if some hypothetical external shocks occur. The recent examples of Brexit (UK) and Catalonia (Spain) show that firms, after changes in the institutional framework, could actually decide to relocate elsewhere.

The case of Ticino, the southern Swiss canton, is analysed by considering two hypothetical scenarios: an appreciation of the Swiss Franc and changes in the bilateral agreements between Switzerland and the European Union, introducing considerable restrictions to the free movement of people and goods. Ordered logit models (one for each scenario) are applied in order to model the relocation probability. Results show that firms having local interests (i.e. clients and suppliers) have a lower propensity for moving. On the other hand, branches and headquarters show a higher propensity toward relocating. Finally, we find that evaluations of firms differ among scenarios.



**JEL Classification:** D22, R12, R30

**Key Words:** Firm relocation, stated preferences, ordered logit model, Switzerland.

## 2.1 Introduction

In the regional economics literature, firm location decision is one of the most studied topics due to the important consequences that this issue has on the economic development of a territory (McCann 2001). However, there are other key events in firm demography beyond its birth, such as growth, reshaping, migration and death, which deserve to be studied. In particular, firm migration is interesting from both a theoretical and practical point of view. Indeed, relocation provides at the same time the best showcase of entrepreneurial decision-making with regard to location choice and the ideal context to inspire goals for regional economic development policy (van Dijk and Pellenbarg 2000).

Although much has been done from a theoretical point of view or by using aggregated data, much less attention has been paid to empirical studies on relocation at the micro level (Brouwer et al. 2004; Targa et al. 2006; Maoh and Kanaroglou 2007; Bodenmann and Axhausen 2012). This is probably due to the difficulty of collecting complete individual data on firm migration.

This chapter seeks to contribute to the empirical literature on firms' relocation, by studying the influence of company and territory characteristics on the probability of moving away from a region.

As the recent examples of Brexit (UK) and Catalonia (Spain) have shown, relocation of firms after changes in the institutional framework has become a relevant topic in the current discussion. Indeed, the United Kingdom's decision to leave the European Union and the risk of secession of Catalonia from Spain have pushed some firms and international company groups to leave these regions, due to the uncertainty created by these events.

Events influencing the institutional framework in which firms operate can potentially occur everywhere. We consider the case of Switzerland, which is heavily dependent on European Union decisions and policies, although it is a non-member country. In particular, we analyse the firms' propensity to relocate within the next five years out of Ticino, the southern Swiss canton. Our main purpose is to study whether and how this probability changes if there are some hypothetical external shocks, which are particularly relevant for the Swiss context. In particular, we take into account relocation

decisions in the case that a strong appreciation of the Swiss Franc (CHF) occurs, or in the case that there are changes in the bilateral agreements between Switzerland and the European Union (EU), introducing considerable restrictions to the free movement of people and goods.

Since firm relocation is a particular form of locational adjustment to changes in markets, environmental regulations and technological progress (Pellenbarg et al. 2002), we focus on these two hypothetical events, which could impact business activities located in Ticino. In particular, an appreciation of the Swiss currency could strongly influence the export possibilities of firms, which could no longer consider Switzerland as a favourable location. The same firm reaction could occur in the case of changes in the bilateral agreements between Switzerland and the European Union. Indeed, the EU member countries are the most important commercial partners of the Swiss firms (in 2015, 54% of Swiss exports went to EU and 72% of Swiss imports came from EU). Moreover, border regions, like Ticino, take advantage of the proximity to EU in terms of labour market and availability of skilled workforce.

At the time of our data collection among firms (2014), these scenarios were actually plausible. On the one hand, Swiss firms have already experienced an appreciation of the currency: from August 2009 to August 2011, the Swiss Franc appreciated by 48% with respect to the Euro currency, while since September 2011 the Swiss National Bank has introduced and hereafter has upheld the minimum threshold of 1.20 Francs for one Euro. In January 2015, after our data collection, the Swiss National Bank announced the abolishment of this minimum exchange rate, leaving the currency free to fluctuate and, therefore, to appreciate. Initially, the Swiss Franc appreciated by approximately 20%, while in the following years it progressively depreciated to 1.10 Francs for one Euro in 2016, and to 1.17 Francs for one Euro in 2017.

On the other hand, in February 2014, the Swiss population approved a referendum against “mass immigration”, establishing upper limits for foreigners living and/or working in Switzerland. The Swiss Confederation has to establish and apply these upper limits within three years and all the international treaties opposing these rules, such as the clause on the free movement of people in the bilateral agreements with the European Union, will

have to be renegotiated. However, the Bilateral Agreements establish that if the contracting parties disregard one of the clauses, the entire structure of the agreements will collapse, damaging therefore commerce, cross border research activities and transports.

Given the uncertain climate that Swiss businesses (and in particular those in Ticino) have to face, this chapter aims to give some insights into the behaviour of firms under specific scenarios.

Following this introductory section, the next one is dedicated to the description of the theoretical framework. The survey and the empirical model are discussed in sections 3 and 4. The fifth section highlights the main results and presents a brief discussion. Finally, some conclusions and future research ideas are presented.

## 2.2 Theoretical framework

The geographical distribution of firms is associated with high impacts on the economy at the local, regional and global levels (McCann 2001) and has wide implications for regional planning policy (Brouwer et al. 2004).

Foreign direct investments (FDI) and international delocalisation are the focus of a large strand of literature in international economics that analyses international relocation of production (Crozet et al. 2004; Pfistera and Deffains 2005; Buch et al. 2005; Lu et al. 2014). Moreover, industry 4.0 and the technological evolution driven by digitalisation has induced researchers to investigate the reshoring phenomenon (Ellram et al. 2013; Tate 2014).

Firm relocation at the local/regional level is less frequently debated. However, the lowest spatial scale is particularly interesting in terms of different development among regions and in terms of real effects on local communities.

Previous studies distinguish two forms of relocation: complete and partial migration. The first one implies the movement of an establishment from address A to address B. Above all, single site firms opt for this strategy, which tends to be executed locally (Kemper and Pellenbarg 1999). On the other hand, partial relocation consists of setting up a new local unit, linked to the pre-existing one that still operates (Schmenner

1980). Multi-plant or growing firms, with the purpose of taking advantage of the most favourable locations, mainly adopt this strategy (Brouwer et al. 2004). In this chapter, we take into account only complete relocation.

Although there are very few theories on companies' relocation, there is an increasing interest in studying the so-called "relocation factors", i.e. the features driving the migration decision. According to this strand of literature, there are three categories of factors driving relocation: internal factors (e.g., age and size), external factors (e.g., market characteristics) and location factors (e.g., territory characteristics) (van Dijk and Pellenbarg 2000).

Concerning internal factors, firm size is one of the key factors that influences moving costs and organisational tasks and therefore affects relocation propensity (Pennings and Sleuwaegen 2000; De Bok and Sanders 2005; Sleutjes and Beckers 2013; Nguyen et al. 2013). In particular, since these issues are considerable for large firms, the higher the number of employees, the lower the propensity to move (van Dijk and Pellenbarg 2000). Another firm characteristic that influences a firm's choices is its age: the older the firm, the less the probability of moving (Strauss-Kahn and Vives 2009; Kronenberg 2013). Indeed, older firms are more embedded in their spatial environment (Sleuwaegen and Pennings 2006). The sector is frequently taken into account in the relocation literature: tertiary sector companies, and in particular business services, are more "footloose" (De Bok and Sanders 2005; Sleutjes and Beckers 2013; Nguyen et al. 2013). Organisational structure also affects the propensity to move: firms belonging to a multinational group are often more mobile, in order to take advantage of amenities and taxation in different locations (Sleuwaegen and Pennings 2006; Strauss-Kahn and Vives 2009).

Looking at the external factors, previous studies underline the role of the network (in particular, proximity to customers and suppliers) in influencing a firm's choices (Targa et al. 2006). Brouwer et al. (2004) find that companies that serve larger markets are more mobile. Agglomeration economies are one of the key topics in regional economics and, in particular, in explaining firm location decisions. Agglomeration of the same industry firms, interdependence among companies of different sectors are often taken into account

in relocation studies (Holl 2004; Bodenmann and Axhausen 2012; Kronenberg 2013). Various indicators are used in order to capture positive externalities due to agglomeration, in particular the Ellison and Gleaser (1997) EG index, which controls for differences in firm numbers across sectors in quantifying the extent of geographic clustering, has been applied in numerous empirical works (see among others Brülhart et al. 2012). Externalities due to spatial concentration of people (urbanisation effects) were investigated in the literature with ambiguous results: positive effects may derive from a higher local demand, stronger presence of a skilled workforce and wider supply of local public services and cultural amenities in denser areas. On the other hand, there could be negative effects if congestion issues (for example, pollution, higher land rent, etc.) prevail.

Concerning location factors, one of the older theories on firm location is based on considerations of transportation costs and accessibility (Weber 1909). However, recent studies also underline the role of this factor in explaining location and relocation decisions (Holl 2004; Holguin-Veras et al. 2005; Sleutjes and Beckers 2013). In particular, De Bok and Sanders (2005) argue that accessibility appears to be of modest importance in the locational preferences of firms, if compared to wage levels or to availability of space. Nevertheless, locations near a highway entrance or with a train station are attractive for specific industries.

Finally, the institutional environment surely has a significant impact on firm behaviour. The role of taxation is well known in the literature (among others, see the meta-analysis by De Mooij and Ederveen 2003): firm location is quite sensitive to differences in corporate tax levels. Governmental policies in general, such as environmental and private property regulations, special business zones, subsidies and incentive programmes for firms are of primary importance for understanding locational preferences of firms. However, there are other location characteristics, often intangible, such as safety and quality of life, which make a municipality attractive not only for residential purposes, but also for business activities (Love and Crompton 1999; Pellenbarg et al. 2002).

The difficulty of collecting complete individual data on firm migration has led some authors to study firms' behaviour through surveys and interviews. For example, Verhetsel et al. (2015) and Leitham et al. (2000) study the locational preferences of firms

by using stated preference experiments. In their analysis, the firm has to choose among different scenarios/locations, characterised by different combinations of levels of attributes, concerning for example accessibility, skilled workforce availability, etc. Looking at relocation, van Dijk and Pellenbarg (2000) study the propensity to move within the next two years of Dutch firms, using survey data.

As far as we know, this chapter is the first attempt to study relocation behaviour of firms by considering external shocks, and to investigate the potential different influences of relocation factors on the propensity to move under different scenarios.

## 2.3 The survey

The data were collected with an online survey among Ticino firms in 2014. The questionnaire was explicitly addressed to the CEO/upper management of the firm. A sample of 5890 firms was randomly selected from the Bureau van Dijk business listing, reflecting sectorial composition of the Ticino economy (70% of the sampled businesses are in the tertiary sector).

The overall response rate was 13%, in line with previous studies using questionnaires with firms (Kawamura 2004). From the 773 questionnaires filled in, we exclude incomplete questionnaires and all firms with zero employees (which are mainly foreign branches with only legal residence in Ticino), since they are not relevant for the purposes of our analysis. Therefore, 654 firms are considered in the model. The survey was built by following some examples in the literature (Targa et al. 2006) and could be divided into four main sections. The first one aims to collect general information about the enterprise: sector, age, spatial organisation (head office and branches), size, as well as information on relevant geographic markets (where suppliers and customers are located). In the second section, firms are asked to rate the importance and presence in Ticino of some location factors, such as political stability, quality of life, legal safety, transparency and access to institutions, etc. The third part is devoted to business relations, in particular to understanding frequency, destination and means of transport used for business trips.

Finally, the last section contains some hypothetical questions on future actions of companies and in particular on possible relocation outside Ticino.

Table 2.1 shows some descriptive statistics regarding the sample: 72.6% of firms in the sample operate in the tertiary sector; these are mainly firms more than 4 years old (75%) and sole proprietorships (81.7%). Moreover, about 71% of them are micro firms (with less than 10 workers). These sample characteristics reflect the economic structure of Ticino, which is mainly composed of micro firms (89% of the businesses in Ticino in 2014), sole-proprietorships (87%) and those operating in services (81%).

| **Category** | | **Sample (n)** | **Sample (%)** |
|---|---|---|---|
| **Sector** | Secondary | 179 | 27.4% |
| | Tertiary | 475 | 72.6% |
| **Age** | Less than 3 years old | 164 | 25.0% |
| | More than 4 years old | 490 | 75.0% |
| **Organisational structure** | Sole proprietorship | 534 | 81.7% |
| | Branch | 54 | 8.2% |
| | Headquarters | 66 | 10.1% |
| **Size** | Micro | 464 | 71.0% |
| | Small | 153 | 23.4% |
| | Medium-Large | 37 | 5.6% |

Table 2.1 - Sample descriptives

## 2.4 The empirical model

As stated above, the last part of the survey contains some hypothetical questions, formulated as Likert scales, on firms' future behaviour and in particular on possible relocation outside Ticino across different scenarios.

We use the following three questions:

I. "How likely is it that your firm will relocate outside Ticino within the next five years? 1 (Very unlikely), 5 (Very likely)". We consider it as the "base" scenario.

II. “How likely is it that your firm will relocate outside Ticino, in the case that an appreciation of the Swiss Franc occurs? 1 (Very unlikely), 5 (Very likely)”.

III. “How likely is it that your firm will relocate outside Ticino, in the case that there are changes in bilateral agreements between Switzerland and EU, introducing considerable restrictions to the free movement of people and goods? 1 (Very unlikely), 5 (Very likely)”.

as indicators for the dependent variables in the ordered logit models.

The distribution of the propensity to move across the scenarios is shown in Table 2.2. Almost 83% of the firms in the sample claim that they will not leave Ticino within the next five years (base scenario). This percentage decreases in the case that an external shock occurs: respectively to 75.6% in the appreciation scenario and to 77% in the bilateral agreements changes scenario. Looking at the scenario with the appreciation, the percentages of firms that choose 2 (unlikely) or 3 (neither unlikely nor likely) on the Likert scale increase in comparison to the base scenario. On the contrary, the percentages of firms in the sample that are likely (choose 4 on the scale) or almost certain (choose 5) to leave Ticino increase by almost one percentage point in the scenario with changes in bilateral agreements, if compared to the base scenario. Agreements with the European Union are strategic, and possible changes will create high uncertainty among businesses. Thanks to these descriptive statistics, we have preliminary evidence that the firms in the sample have a different propensity to move depending on the presented scenario.

| | 1 – Not at all likely | 2 - Unlikely | 3 – Neither unlikely nor likely | 4 - Likely | 5 – Very likely or almost certain |
|---|---|---|---|---|---|
| Relocate within the next 5 years *(base scenario)* | 82.7% | 7.5% | 5.2% | 1.2% | 3.4% |
| Relocate in the case of an appreciation of the Swiss Franc *(CHF scenario)* | 75.6% | 11.3% | 8.1% | 1.8% | 3.2% |
| Relocate in the case of changes in bilateral agreements between CH and EU *(bil scenario)* | 77.0% | 8.5% | 7.3% | 2.8% | 4.4% |

Table 2.2 - Frequency of the propensity to move (%)

Hypothetical situations are often analysed with ordered logit models: thanks to self-assessed probabilities, we could try to capture agent's behaviour in a future situation. These models are used when the dependent variable is ranked on a scale and, in particular, in stated preference choice experiments with Likert scales (Greene and Hensher 2009; Hess and Daly 2014). Many applied works can be found in the literature, on various topics, using this method, for example: education (Machin and Vignoles 2005), health status (Riphahn et al. 2003), transportation (Hensher et al. 2010) and mobilisation time during a hurricane (Sadri et al. 2013), but also firm relocation (van Dijk and Pellenbarg 2000).

Following the work presented in Greene and Hensher (2009), we consider a latent variable $y^*$ that captures the relocation strategy of the firm and can be described by the following latent regression model

$$y_i^* = \beta' x_i + \mathcal{E}_i \tag{2.1}$$

that is observed in discrete form through a censoring mechanism.

In particular, the latent variable is represented by a discrete and ordinal indicator $y_i$, which is the self-assessed probability of relocating outside Ticino:

$$\begin{aligned} y_i &= 1 \text{ if } \mu_0 < y_i^* < \mu_1 \\ y_i &= 2 \text{ if } \mu_1 < y_i^* < \mu_2 \\ y_i &= 3 \text{ if } \mu_2 < y_i^* < \mu_3 \\ y_i &= 4 \text{ if } \mu_3 < y_i^* < \mu_4 \\ y_i &= 5 \text{ if } \mu_4 < y_i^* < \mu_5 \end{aligned} \tag{2.2}$$

The sample observations (firms) are labelled $i = 1, \ldots, n$; the vector of unknown parameters $\beta$ and the J+1 thresholds $\mu_j$ are the object of estimation and inference.

The vector $x_i$ contains the explanatory variables, which are assumed to be strictly exogenous of $\mathcal{E}_i$. Table 2.3 provides an overview of the regressors used. Following the literature, we include among the regressors the firms' characteristics: age, size, sector (in particular, dummy variables for manufacturing, business services, other activities in the secondary and in tertiary sectors) and spatial organisation of the firm (if the firm is a branch, sole proprietorship or headquarters). In addition, we introduce some external

factors, such as an index for urbanisation effects (population density) and the Ellison and Gleaser (1997) index for agglomeration economies. Moreover, the number (measured on a Likert scale from 1 to 5) and location of suppliers and customers is also taken into account. Location characteristics are introduced by considering two dummy variables for accessibility (presence/absence of a railway station and highway entrance), local taxation level as a proxy for institutional and regulatory framework, and a measure for safety in the municipality as a proxy for quality of life.

We assume that the error term $\mathcal{E}_i$ is IID Logistic distributed with mean 0, scale parameter 1 and cumulative distribution function $\Lambda(\mathcal{E}_i|x_i) = \Lambda(\mathcal{E}_i)$.

Given these assumptions, the probabilities associated with the observed outcomes are:

$$Prob[\, y_i = j \mid x_i] = Prob[\mu_{j-1} < y_i^* < \mu_j] = Prob[\mu_{j-1} < \beta' x_i + \mathcal{E}_i < \mu_j] =$$
$$= Prob\,[\mathcal{E}_i < \mu_j - \beta' x_i\,] - Prob\,[\mathcal{E}_i < \mu_{j-1} - \beta' x_i] = \Lambda\,[\mu_j - \beta' x_i] - \Lambda\,[\mu_{j-1} - \beta' x_i] \qquad (2.3)$$

with j = 0, 1, … , J.

For identification purposes, we impose that $\mu_{j-1} < \mu_j$; $\mu_0 = -\infty$ and $\mu_5 = +\infty$.

The log-likelihood function, based on the previous implied probabilities, is:

$$\log L = \sum_{i=1}^{n} \sum_{j=0}^{J} m_{ij} \log\,[\Lambda\,(\mu_j - \beta' x_i) - \Lambda(\mu_{j-1} - \beta' x_i)] \qquad (2.4)$$

where $m_{ij} = 1$ if $y_i = j$ and 0 otherwise. Thanks to the maximum likelihood estimator (MLE), it is possible to estimate the parameters $\beta$ and $\mu$.

| Variables | Operationalization | Mean | Std. Dev. |
|---|---|---|---|
| Suppliers in Ticino | How many suppliers firm has in Ticino | 1.48 | 1.05 |
| Suppliers in the rest of CH | How many suppliers firm has in Switzerland, excluding Ticino | 1.30 | 0.68 |
| Suppliers in Italy | How many suppliers firm has in Italy | 1.35 | 0.79 |
| Suppliers in west-central Europe | How many suppliers firm has in west-central Europe (Germany, France, Austria, Czech republic, Belgium, Luxembourg, Netherlands, UK, Ireland) | 1.23 | 0.66 |
| Clients in Ticino | How many clients firm has in Ticino | 3.69 | 1.32 |
| Clients in the rest of CH | How many suppliers firm has in Switzerland, excluding Ticino | 1.82 | 0.92 |
| Clients in Italy | How many clients firm has in Italy | 1.80 | 1.00 |
| Clients in west-central Europe | How many clients firm has in west-central Europe | 1.57 | 0.92 |
| Services | Firm belongs to business services (financial and insurance activities, real estate, administrative, scientific and professional activities) - dummy variable | 0.35 | 0.48 |
| Manufacturing | Firm belongs to manufacturing sector - dummy variable | 0.15 | 0.36 |
| Other tertiary | Firm belongs to tertiary sector, business services excluded - dummy variable | 0.37 | 0.48 |
| Other secondary | Firm belongs to secondary sector, manufacturing excluded - dummy variable | 0.12 | 0.33 |
| Size | How many workers the plant in Ticino has | 16.90 | 56.75 |
| Age | How old the firm is | 22.21 | 45.18 |
| Sole proprietorship | Firm is a sole proprietorship - dummy variable | 0.82 | 0.39 |
| Branch | Firm is a branch of a company group - dummy variable | 0.08 | 0.28 |
| Headquarters | Firm is an headquarters of a company group - dummy variable | 0.10 | 0.30 |
| Municipality multiplier | Local tax level in the municipality in 2014 | 80.60 | 10.08 |
| Violations | Number of violations of Criminal Code (per 1000 inhabitants) in the municipality in 2014 | 62.85 | 22.70 |
| Highway entrance | Presence of a highway entrance in the municipality - dummy variable | 0.52 | 0.50 |
| Railway station | Presence of a railway station in the municipality - dummy variable | 0.75 | 0.43 |
| Population density | Population in the district per square kilometre in 2014 | 931.10 | 874.75 |
| EG agglomeration index | For industry i (3 digit NOGA) in a district (d) in 2013: $EG_i = \frac{\sum_d (s_d - x_d)^2 - \left(1 - \sum_d x_d^2\right)\sum_j z_j^2}{\left(1 - \sum_d x_d^2\right)\left(1 - \sum_j z_j^2\right)}$ $s_d$ = share of industry i employment in district d $x_d$ = share of employment in district d $z_j$ = share of industry i employment in plant j | 0.06 | 0.51 |

Table 2.3 - Explanatory variables

## 2.5 Results and discussion

Table 2.4 presents the results of the three ordered logit models, one for each scenario. One of the main results of the analysis concerns the geographical distribution of clients and suppliers. What clearly emerges is that the higher the number of current customers the firm has in Ticino, the lower the intention to relocate out of the canton, in all the three scenarios. The end market of the firm is an essential determinant of the location choice: businesses with a local market have no interest in leaving the territory. This is true even if an external shock occurs.

On the other hand, the higher the number of commercial relationships (in terms of current customers) the firm has in Italy, the higher the intention to relocate out of Ticino, in the case that one of the two shocks occurs. This kind of firm benefits from both proximity to Italy and the favourable Swiss institutional context. Since Italy is one of the most important commercial partners of Ticino firms, in the case of possible damage to exports or hard-to-find appropriate workforce, these firms will probably decide to leave Ticino.

The chance of possible damage to exports, due to appreciation, also influences the choices of firms with customers in west-central Europe: the higher the number of these relationships, the higher the intention to relocate out of Ticino (both in the base scenario and in the appreciation scenario). Indeed, the exchange rate would particularly penalise these companies that trade with the Euro area.

The results regarding suppliers require caution in the interpretation, since only a limited number of firms in the sample answered to these questions.

Looking at the characteristics of the firm, results show that headquarters, if compared to sole proprietorships, show a higher propensity towards relocating out of the canton, in each scenario. Indeed, as highlighted in previous studies, the rate of movement of headquarters is significant (Strauss-Kahn and Vives 2009).

| Variables | Base scenario | CHF app. scenario | Bilateral agr. scenario |
|---|---|---|---|
| Manufacturing | fixed | fixed | fixed |
| Other secondary | 0.752 | 0.0132 | -0.172 |
| | (0.48) | (0.37) | (0.38) |
| Services | 0.591 | -0.188 | -0.128 |
| | (0.43) | (0.32) | (0.31) |
| Other tertiary | 0.283 | -0.184 | -0.358 |
| | (0.43) | (0.32) | (0.3) |
| Sole proprietorships | fixed | fixed | fixed |
| Branch | 0.456 | 0.431 | **0.665**** |
| | (0.35) | (0.34) | **(0.33)** |
| Headquarters | **0.618*** | **0.743***** | **0.803***** |
| | **(0.34)** | **(0.29)** | **(0.27)** |
| Size | -0.00218 | 0.00063 | 0.00172 |
| | (0.002) | (0.002) | (0.002) |
| Age | -0.0064 | -0.00648 | **-0.0127**** |
| | (0.005) | (0.005) | **(0.005)** |
| Clients in Ticino | **-0.218***** | **-0.416***** | **-0.286***** |
| | **(0.09)** | **(0.075)** | **(0.08)** |
| Clients in the rest of CH | -0.111 | -0.204 | **-0.254**** |
| | (0.13) | (0.13) | **(0.13)** |
| Clients in Italy | -0.00571 | **0.302***** | **0.309***** |
| | (0.12) | **(0.1)** | **(0.09)** |
| Clients in west-central Europe | **0.227*** | **0.291***** | 0.172 |
| | **(0.13)** | **(0.11)** | (0.11) |
| Suppliers in Ticino | -0.196 | -0.0336 | 0.114 |
| | (0.17) | (0.14) | (0.13) |
| Suppliers in the rest of CH | 0.254 | 0.0819 | -0.0196 |
| | (0.22) | (0.21) | (0.22) |
| Suppliers in Italy | 0.169 | **0.270**** | **0.208*** |
| | (0.18) | **(0.12)** | **(0.13)** |
| Suppliers in west-central Europe | **-0.488**** | -0.224 | -0.197 |
| | **(0.25)** | (0.15) | (0.17) |

| Variables | Base scenario | CHF app. scenario | Bilateral agr. scenario |
|---|---|---|---|
| EG index for agglomeration | -0.167 | -0.23 | -0.0513 |
| | (0.22) | (0.21) | (0.11) |
| Population density | **-0.0003**** | -0.000098 | -0.00005 |
| | **(0.0001)** | (0.0001) | (0.0001) |
| Rail station | -0.22 | -0.114 | 0.443 |
| | (0.28) | (0.28) | (0.29) |
| Highway entrance | -0.107 | 0.252 | 0.162 |
| | (0.25) | (0.24) | (0.25) |
| Violations | 0.00656 | 0.00302 | 0.00683 |
| | (0.005) | (0.005) | (0.005) |
| Municipality multiplier | 0.0052 | 0.00104 | 0.004 |
| | (0.012) | (0.01) | (0.01) |
| Observations | 654 | 654 | 654 |
| Final log-likelihood | -417.333 | -490.523 | -496.087 |
| Adjusted rho square | 0.53 | 0.443 | 0.466 |

Robust std errors in parenthesis. *** p<0.01, ** p<0.05, *p<0.1

Table 2.4 - Results of the ordered logit models

Branches (if compared to sole proprietorships) show a higher propensity towards relocating out of Ticino only in the scenario with changes in the bilateral agreements. Multinational firms operate in a flexible network, and thus can easily shift activities to other countries (Sleuwaegen and Pennings 2006), especially if labour market and commercial conditions worsen.

In the analysed case study, we find no evidence that location characteristics, such as accessibility, local tax level, etc., have an impact on relocation intentions. This is probably because we consider only one side of the phenomenon. Indeed, relocation explicitly takes into account the fact that one site is substituted for another; therefore the characteristics of both origin and destination regions are considered by the firm. In the current study, we do not take into account the characteristics of possible destination locations. Moreover, this can also be ascribable to the limited variation in the variables' values across municipalities.

The only location factor with a negative and significant coefficient is the population density in the base scenario: urbanisation effects prevent firms from relocating out of Ticino, but only without external shocks.

Finally, in order to support our hypothesis that the firms in the sample have a different propensity to move depending on the presented scenario, we estimate a Pooled OLS model with cluster standard errors. Results are shown in Appendix B. The dummy variable for the Base scenario is taken as a reference and the variables for the other two scenarios are introduced into the model. The estimated coefficient associated to the scenario supposing a Swiss Franc appreciation and the one associated to the scenario assuming changes in the bilateral agreements are both statistically significant, meaning that the evaluations of firms actually differ among scenarios.

A criticism that can be made against this type of analysis regards the possibility that intentions shown in the survey are not coherent with the actual future behaviour of the firm. Aside from the fact that this problem could concern all stated preference discrete choice experiments, we collect new data in 2017 on the actual behaviour of firms. From the Business Register of Canton Ticino, we check the addresses of the firms in the sample in the last three years in order to detect possible relocations.

We compare this information with the firms' answers to the question "How likely is it that your firm will relocate outside Ticino within the next five years?"

| | How likely is it that your firm will relocate outside Ticino within the next five years? | | |
|---|---|---|---|
| **Actual behaviour** | **Firms answering 1 or 2** | **Firms answering 3** | **Firms answering 4 or 5** |
| N° of firms relocating outside Ticino | 0 | 3 | 3 |
| N° of firms relocating within Ticino | 60 | 4 | 3 |
| N° of firms not relocating | 502 | 26 | 18 |
| N° of firms cancelled from register/not found | 29 | 1 | 5 |
| Total | 591 | 34 | 29 |

Table 2.5 - Comparison with the actual behaviour of firms in the sample

Table 2.5 shows that, among firms that were not at all likely or unlikely (chose 1 or 2 on the scale) to leave Ticino within the next five years, 85% of them did not actually

relocate in the last three years. On the contrary, among the 29 firms that answered 4 or 5 (likely or almost certain relocation), only 3 firms had left Ticino in the last three years. Therefore, only a few firms have already left Ticino. This result confirms that long-distance relocation decision is a costly process that often requires a long lapse of time. Another interesting piece of information regards the quite high (10%) percentage of firms in the overall sample that actually relocated within Ticino in last three years. This descriptive evidence confirms a common result in the literature: generally, firms' relocation takes place within small distances (Stam 2003).

## 2.6 Conclusions

In a changing world where investments, trade and technology follow new emerging global trends, doing business has become more and more complex. In this context, the choice of the location of the firm appears to be more strategic than ever. If Switzerland has been so far considered a safe harbour for doing business, nowadays some uncertain conditions highlight new challenges even in this country.

The main goal of this chapter is to understand the propensity of firms to relocate out of Ticino, the southern Swiss canton, by considering different scenarios. Using new micro data, we apply the stated preference methods in order to investigate future behaviour of firms. Thanks to the estimation of ordered logit models, we obtain specific results for each scenario.

As demonstrated by the literature review, understanding causes and consequences of relocation of firms is a complex issue. So far, this topic has mainly been investigated on an aggregate level. However, the use of firm level information enhances the analysis with further insights and avoids endogeneity problems which may be caused by unobserved heterogeneity.

As far as we know, this work is the first attempt to study how relocation behaviour changes among different scenarios with external hypothetical shocks. Results show that different scenarios have different impacts on the relocation probability. In line with previous studies, we can conclude that economic and institutional policies, which could change the environment where the firm operates, influence relocation behaviour.

Therefore, policy makers should pay attention to possible undesired consequences of specific measures.

Concerning the results on the relocation factors, it is particularly interesting what emerges on the role of commercial relationships: businesses with a local market have no interest in leaving the territory, even if some shocks damage the entire economy. On the other hand, if the end market of the firm is in another country, the probability of relocation increases. We can therefore conclude that the location and the intensity of commercial linkages, and in particular of customers, is an essential determinant of the location and relocation choices. Moreover, our analysis confirms that headquarters, when compared to sole proprietorships, show a higher propensity towards relocation.

Finally, concerning the agglomeration economies, we find that only urbanisation effects prevent firms from relocating out of Ticino. However, when an external shock occurs, this advantage is not a sufficient deterrent to relocation.

There are limits to the current analysis. As anticipated above, we do not take into account the characteristics of possible destination locations, the so-called pull factors. Previous literature underlines that relocation is often driven by the more attractive features of the destination location, in comparison to the current location of the firm.

Another issue regards the coherence of firms' behaviour. As anticipated in the previous section, only a few firms have already left Ticino, even though they have shown a high propensity toward relocation in the survey. Future research should monitor the potential movements of these firms in the next years, and eventually explore the motivations of those not relocating by means of interviews.

## Appendix B. Estimation results of Pooled OLS model.

| Variables | Pooled OLS |
|---|---|
| Base scenario | fixed |
| Bilateral agr. scenario | **0.14*** (0.04)** |
| CHF app. scenario | **0.107** (0.04)** |
| Manufacturing | fixed |
| Other secondary | 0.085 (0.09) |
| Services | 0.02 (0.09) |
| Other tertiary | 0.012 (0.08) |
| Sole proprietorships | fixed |
| Branch | **0.24** (0.12)** |
| Headquarters | **0.26** (0.12)** |
| Size | 0.000046 (0.0005) |
| Age | -0.0008 (0.0005) |
| Clients in Ticino | **-0.125*** (0.03)** |
| Clients in the rest of CH | **-0.099*** (0.04)** |
| Clients in Italy | **0.101*** (0.04)** |
| Clients in west-central Europe | **0.08* (0.05)** |
| Suppliers in Ticino | -0.017 (0.03) |
| Suppliers in the rest of CH | 0.024 (0.05) |
| Suppliers in Italy | **0.11*** (0.04)** |
| Suppliers in west-central Europe | **-0.114*** (0.05)** |
| EG index for agglomeration | **-0.044** (0.02)** |
| Population density | -0.00004 (0.00003) |
| Rail station | -0.041 (0.08) |
| Highway entrance | 0.055 (0.07) |
| Violations | 0.0022 (0.002) |
| Municipality multiplier | 0.00096 (0.0029) |
| Constant | **1.44*** (0.27)** |
| Observations | 1962 |
| R-squared | 0.11 |

Robust std errors in parenthesis. *** p<0.01, ** p<0.05, *p<0.1

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# Chapter 3

## What makes firms move? Location optimisation within and between metropolitan areas

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## Abstract

In the regional economics literature, location and relocation decisions of firms are one of the most discussed topics due to their relevance from an economic policy point of view. This chapter seeks to contribute to the empirical literature on the relocation of firms within and between metropolitan areas. We investigate why firms that already are in a very productive territory should decide to move within the same area, given that relocation is costly. In particular, our curiosity regards the influence of different known driving factors on destination choice for relocating firms within Polish metropolitan areas and we study the preferences of firms having different characteristics.

A nested logit model is applied, with sampling of alternatives. Results underline the role of age in determining the relocation decision of firms. In particular, older firms show a lower propensity for moving, while the location change can represent an opportunity for young firms to grow, evolve and survive, in the challenging phase of the first years of business life. Moreover, our results demonstrate the relevance of urbanisation economies and availability of space in the locational preferences of firms; finally, we observe that firms are willing to pay higher salaries in order to take advantage of the dynamic economic environment of metropolitan areas.



**JEL classification:** D22, R12, R30

**Keywords:** Firm relocation, destination choice, metropolitan areas, firm's age.

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## 3.1 Introduction

The location decision of firms is one of the most discussed topics in the regional economics literature. It has been addressed since the middle of the nineteenth century, but the scientific debate is still open. This is probably due to its relevance from an economic policy point of view: knowing qualities and weaknesses of a territory allows the policy maker to retain companies and to promote the attractiveness of a location.

Business relocation is associated with high impacts on the economy at the local, regional and global levels (McCann 2001). There is a flourishing strand of literature that concentrates on delocalisation at a global scale, focusing on various types of foreign direct investments (FDI) and diffusion of multinational corporation's plants among countries (Crozet et al. 2004; Buch et al. 2005; Sleuwaegen and Pennings 2006; Lu et al. 2014).

Plant relocation at the local/regional level is less frequently debated. However, the lowest spatial scale is particularly interesting in terms of different development among regions and in terms of real effects on local communities. Only a few studies based on empirical research at the individual firm level have been carried out. Among others, some recent works analyse firm relocation choices in the Netherlands (van Dijk and Pellenbarg 2000), in Switzerland (Bodenmann and Axhausen 2012), in the USA (Maryland state, Targa et al. 2006) and in Canada (city of Hamilton, Maoh and Kanaroglou 2007).

Concerning location choices of firms and destination decisions of relocating companies, Poland represents a particular example, which deserves to be studied. Since 1990, when the "shock therapy" programme was introduced in order to start the economic liberalisation process, Poland's economy has quickly grown, with a peak in the GDP growth rate of 7% in 1995 and in 2007. Moreover, since 2004, when Poland joined the European Union as a full member, it has attracted thousands of companies from other European countries, in particular from Germany. Previous studies concerning FDI in Poland (Cieslik 2005a and 2005b) concentrate on the effects of the national border on the location of foreign firms.

This dynamic business climate makes Poland an interesting case study of location and relocation of companies (Dej 2015). The present chapter focuses on firms located in the five major Polish metropolitan areas (Warsaw, Krakow, Lodz, Wroclaw and Poznan).

These regions are selected since the economic processes have the greatest intensity in these types of geographical entities and there is a high concentration of companies. Moreover, these areas are characterised by a high potential for innovation and play the role of strategic nodes, attracting both foreign and local investments. Previous studies concentrate on the examination of new establishments' location choices within metropolitan areas, since these territorial units are characterised by the most advantageous conditions for technological change, agglomeration economies and quality of life (Frenkel 2001; Hou 2016). Relocation processes within and among metropolitan areas were less studied. An interesting question to consider is why firms would undertake a costly relocation within or among metropolitan areas rather than looking for a low costs alternative.

This article aims to shed light on this phenomenon. Indeed, we investigate the influence of different factors on the destination choice of firms with different characteristics that have been relocated within metropolitan areas.

If we consider that firms constantly monitor market competitiveness and compare their current location with others within metropolitan areas, relocation can be seen as part of an optimisation process in order to maximise profits and improve their position in the market.

As Pellenbarg et al. (2002) suggested, firm relocation could be defined as a particular form of locational adjustment to changes in markets, environmental regulations and technological progress. We can distinguish two forms of relocation: complete and partial migration. The first one implies the movement of an establishment from address A to address B; while, the partial relocation consists of setting up a new local unit, linked to the pre-existing one (Schmenner 1980; Brouwer et al. 2004). In this chapter, we take into account only complete relocation.

The chapter is organised as follows: the next section presents an overview of the literature on firms' relocation. The third section is dedicated to the description of the data, followed by the empirical strategy used. The fifth part highlights the main results and a brief discussion of them. Finally, some conclusions and future research ideas are presented.

## 3.2 Literature review

Theories on companies' relocation are rare and usually represent a special case of location theories (Hayter 1997, Pellenbarg et al. 2002). However, there is a flourishing strand of literature examining the so-called "relocation factors", i.e. the features driving the migration decision. In particular, previous studies distinguish among internal factors (e.g., age and size), external factors (e.g., market characteristics) and location factors (e.g., territory characteristics) (van Dijk and Pellenbarg 2000). Concerning internal factors, Sleuwaegen and Pennings (2006) claim that older firms are more embedded in their spatial environment and therefore show a less mobile behaviour. This peculiarity is also confirmed by some other empirical works (Strauss-Kahn and Vives 2009; Kronenberg 2013).

Another firm characteristic that influences the relocation choice is the sector. In particular, previous studies find that tertiary sector companies, and in particular business services, are more "footloose" (Brouwer et al. 2004; Targa et al. 2006; Sleutjes and Beckers 2013; Nguyen et al. 2013).

Looking at the external factors, there is a wide strand of literature examining agglomeration economies and their influence on firm location decisions. Positive externalities due to spatial concentration of the same industry firms, but also interdependences among companies of different sectors are often taken into account in relocation studies (Holl 2004; Targa et al. 2006; Kronenberg 2013). Various indicators of specialisation and diversity are used in order to capture externalities due to agglomeration. Among others, see Ellison and Gleaser (1997), Groot et al. (2014) and Mameli et al. (2014) for an overview.

Externalities due to spatial concentration of people (urbanisation effects) have been investigated in the literature with ambiguous results: positive effects may derive from a higher local demand, stronger presence of a skilled workforce and wider supply of local public services and cultural amenities in denser areas. On the other hand, there could be negative effects if congestion issues (for example, pollution, higher land rent, etc.) prevail.

Labour market characteristics (such as wages and unemployment) play a crucial role in explaining location and relocation decisions (Holl 2004; Sleuwaegenn and

Pennings 2006; Manjón-Antolín and Arauzo-Carod 2011). Kronenberg (2013) find that low-tech firms paying high average salaries have a high propensity to relocate, suggesting that these firms move in order to save costs.

Concerning location factors, since the work of Weber (1909), there has been a wide scientific debate on the link between transportation costs, accessibility and firms location decisions (Holguin-Veras et al. 2005; Sleutjes and Beckers 2013). In particular, De Bok and Sanders (2005) argue that accessibility appears to be of a modest importance in the locational preferences of firms, if compared to wage levels or to availability of space. Nevertheless, locations near a highway entrance or with a train station are very attractive for specific industries.

Another feature that should not be underestimated is the availability of space. De Bok and Sanders (2005) claim that lack of space for expansion is often push-factor number one.

Institutional environment has surely a significant impact on firm behaviour. The role of taxation is well known in the literature (among others, see the meta-analysis by De Mooij and Ederveen 2003): firm location is quite sensitive to differences in corporate tax levels. The presence of Special Economic Zones (SEZ) also influences the firms' choices, in particular the location decision of foreign direct investments (Cieslik and Ryan 2005; Deichmann and Karidis 2005; Cizkowicz et al. 2017).

However, there are other location characteristics, often intangible, such as safety and quality of life, which make a municipality attractive not only for residential purposes, but also for business activities (Pellenbarg et al. 2002). In particular, there is evidence that some quality-of-life aspects, such as the presence of cultural and natural amenities (Love and Crompton 1999), make certain locations more attractive to firms. Moreover, firm relocation could be influenced by the local quality of life situation. Deteriorated physical surroundings reduce the attractiveness of the environment for potential customers, which indirectly influences the sales and profits of local firms (Sleutjes and Beckers 2013).

Finally, previous studies have verified the importance of distance between previous site and a potential new site, when the firm decides to relocate (e.g. van Oort et al. 2007; Cabus et al. 2008). In particular, Stam (2003) argues that small relocation

distances are preferred. Indeed, in the case of complete relocation, firms moving within short distances avoid the risk of giving up their network of clients and partners, or losing employees, management included. On the other hand, in case of greater distances, firms can take advantage of partial relocation, in order to have access to farther markets.

## 3.3 Data

Our analysis is based on the dataset built for the project "The processes of relocation and spatial expansion of firms in Polish Metropolitan Areas", funded by the Polish National Science Centre. The dataset contains information on firms located in five Polish metropolitan areas (as defined by Smętkowski et al. 2008): Krakow, Warsaw, Wroclaw, Lodz and Poznan, which are monocentric, i.e. with only one main city, the so-called core (see Figure 3.1). The remaining two metropolitan areas in Poland (Upper Silesia and Tricity), which are polycentric, are not included in the dataset.

The dataset includes a random sample of 4799 plants/offices, representing about 10% of the firms operating in the study area in 2008. Sectorial composition of the sample reflects the overall economic structure, with oversampling of manufacturing activities.

Data were collected on establishments employing at least 10 workers, merging information from three main sources: the commercial dataset Hoppenstadt Bonnier Information (HBI), currently known as Bisnode Polska, Poland's REGON business register and Poland's National Court Register, which concerns the relocation information. Given the lack of information in our dataset on the relationships between establishments and their respective position within an organisation (branch, headquarters or sole proprietorship), in the rest of the article, for convenience, we will interchangeably use the terms firms and establishments.

5.5% of firms in the sample experienced relocation in 2008. Since we focus on firms located in the five monocentric metropolitan areas in 2008, we are able to observe relocations within metropolitan areas as well as firms having moved to the metropolitan areas, but not firms that have left these regions.

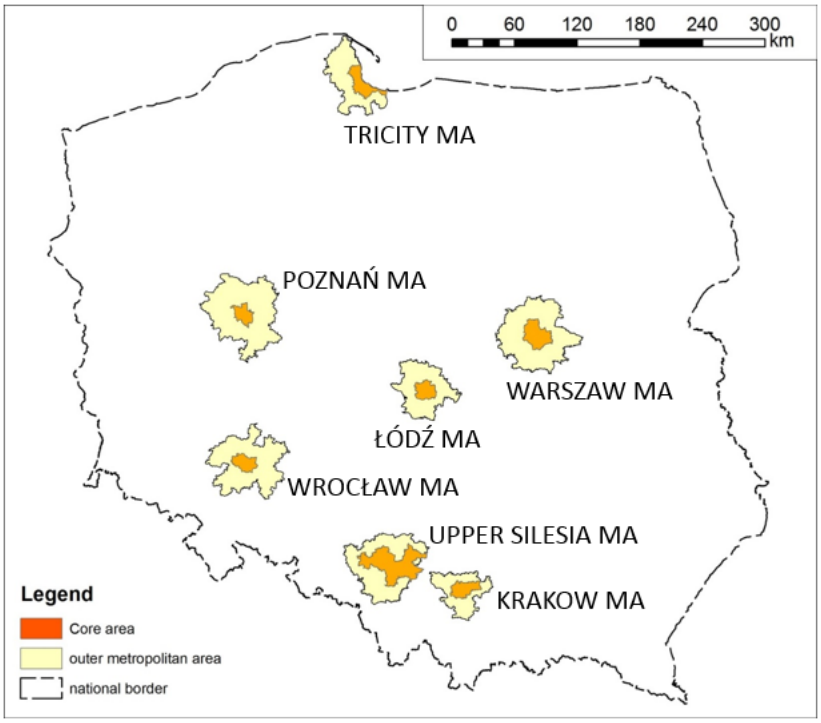


Figure 3.1- Metropolitan areas in Poland. Source: KIPPiM based on Smętkowski et al. (2008)

We decided to focus on 2008, because it was before the economic crisis reached Poland. Therefore, it was possible to observe the behaviour of companies and entrepreneurs in an economic situation unaffected by the extraordinary factor of the crisis in the global financial markets. Indeed, in 2008, Poland recorded a high level of economic growth (4.25% GDP growth) while the unemployment rate was the lowest since the political changes in 1989. Table 3.1 shows some descriptive statistics of the sample. Some sectors are grouped together, since there are only a few firms in them. In particular, we distinguish:

- Manufacturing;
- The rest of the secondary sector (energy, water supply, construction);
- Commerce;
- Transport;
- Finance and real estate;

- Business services (information, communication, professional and administrative activities);
- Personal services (public activities, restaurants and hotels, leisure, other services).

| Category | | Sample (n) | Sample (%) |
|---|---|---|---|
| **Sector** | Manufacturing | 1396 | 29.1% |
| | The rest of the secondary sector | 609 | 12.7% |
| | Commerce | 1423 | 29.7% |
| | Transport | 207 | 4.3% |
| | Finance and real estate | 316 | 6.6% |
| | Business services | 606 | 12.6% |
| | Personal services | 242 | 5% |
| **Age** | 1 to 10 years | 2595 | 54% |
| | 11 to 20 years | 1973 | 41% |
| | More than 20 years | 231 | 5% |
| **Metropolitan area of origin** | Krakow | 867 | 18.1% |
| | Wroclaw | 908 | 18.9% |
| | Warsaw | 1449 | 30.2% |
| | Lodz | 345 | 7.2% |
| | Poznan | 1216 | 25.3% |
| | Other | 14 | 0.3% |
| **Relocation in 2008** | External | 135 | 2.8% |
| | Internal | 129 | 2.7% |
| **External relocation** | Within the same metropolitan area | 99 | 73% |
| | Between different metropolitan areas | 22 | 16% |
| | From rest of Poland to metropolitan areas | 14 | 11% |

Table 3.1 - Sample descriptives

Manufacturing and commerce together represent about 60% of all firms in the sample. Companies have a mean age of about 11 years (standard deviation equal to 7.6). The metropolitan areas of Warsaw (30.2%) and Poznan (25.3%) are the highest populated regions in the sample. As anticipated above, 5.5% of firms relocated in 2008; in particular, 2.7% of them relocated within the same municipality (internal relocation), while 2.8% moved to a different town (external relocation). 73% of firms that experienced external relocation moved within the same metropolitan area; 16% relocated to a municipality in a

different metropolitan area, while only 11% arrived in the study area from another Polish municipality.

In order to study the relocation decision of the firm, we rely on discrete choice models, which consider differences between pairs of alternatives. In particular, the current location of the firm can be interpreted as the observed location chosen among many alternatives, which are not observed but continuously monitored by the firm.

In our model, the alternatives are municipalities in the considered metropolitan areas characterised by a set of variables described in Table 3.2:

- The percentage of legally protected areas within the total area of the municipality and the non-residential buildings per 1000 municipality inhabitants, in order to capture the availability of space.
- The mean monthly salaries paid in a district (in Polish Zloty - PLN) and the percentage of unemployed people in a municipality, in order to take into account labour market characteristics.
- The presence of a railway station and a motorway entrance are considered as accessibility measures.
- The population density, in order to measure the size of the local system, and therefore the market potential, and urbanisation economies (Mameli et al. 2014; Cainelli and Iacobucci 2016).
- Since detailed data on employment are not available, we introduce an index of specialisation, calculated as the share of industry *i* (only 1 DIGIT available) firms in a district *d*, relative to the overall Polish firms:

$$Specialisation_{id} = \frac{f_{id} / \sum_i f_{id}}{f_{i\ Poland} / \sum_i f_{i\ Poland}}$$

This measure captures the specialisation advantage resulting from within-industry knowledge spillovers (Mameli et al. 2014).

- The municipality expenditure for education, culture and environmental protection per capita (PNL, per capita), which is a proxy of the quality of life in a town.
- A dummy variable indicating if the municipality is the core (capital city) of the metropolitan area or not. This variable captures the importance of the

municipality in the region, and it is highly correlated with the presence of universities and airports.

- Dummy variables indicating if the municipality is rural, urban-rural or urban, classified according to the Polish Local Data Bank.
- The distance (in km) between the potential new sites and the current location of the firm (shortest road network calculated with GIS).
- Dummy variables indicating the metropolitan area of the municipality (Krakow, Warsaw, Wroclaw, Lodz and Poznan), in order to take into account if there are some intrinsic features that make the region attractive, potentially causing endogeneity.
- A dummy variable indicating if there is a Special Economic Zone in the territory of the municipality, as identified by the national law (Dz.U. 1994 Nr 123 poz. 600), as a proxy of regional aid. Firms located in the SEZ benefit from tax exemptions, offsetting their investments costs.

| Variables | Unit | Mean | Std. Dev. |
|---|---|---|---|
| Protected areas | % of total area of the municipality | 36.2 | 48.2 |
| Non-residential buildings | Number of non-residential buildings per 1000 inhabitants | 0.82 | 0.6 |
| Mean monthly salary | PLN | 2656.89 | 369.7 |
| Unemployment | % of unemployed inhabitants | 4.4 | 1.9 |
| Municipality with a railway station | Dummy variable [0,1] | 0.61 | 0.5 |
| Municipality with a motorway connection | Dummy variable [0,1] | 0.09 | 0.3 |
| Population density | Number of inhabitants per $km^2$ | 279.74 | 474.8 |
| Specialisation | Share of industry $i$ firms in a district $d$, relative to the overall Poland firms | Sector specific | |
| Municipality expenditure | PLN per inhabitant | 2630.04 | 933.9 |
| Core of metropolitan area | Dummy variable [0,1] | 0.04 | 0.2 |
| Rural municipality | Dummy variable [0,1] | 0.43 | 0.5 |
| Urban-rural municipality | Dummy variable [0,1] | 0.35 | 0.5 |
| Special Economic Zone | Dummy variable [0,1] | 0.32 | 0.5 |
| Distance to previous site (only for relocating firms) | $km$ | 59.2 | 105.9 |

Table 3.2 - Descriptive statistics of the municipalities

All the data were obtained from the Local Data Bank (LDB) of the Central Statistical Office of Poland. The collected data comes from the lowest aggregation level, i.e. NUTS5 (municipality level). In the case of population density, specialisation and mean monthly salaries, the data were collected at NUTS4 (Poviat district level, which gathers some adjacent municipalities). Indeed agglomeration economies do not generally occur at municipal level, but on a wider spatial scale. All the explanatory variables described in Table 3.2 refer to 2007, a year before the relocation behaviour, in order to avoid simultaneity problems in the econometric model (Crozet et al. 2004).

The economic literature also suggests taking into account real estate prices and municipality levels of taxation when looking at relocation decisions of firms. Unfortunately, these data are not available in the case of Poland for 2007: there are a lot of missing values in the official statistics database on real estate prices. Moreover, the Polish fiscal system establishes three main taxes: taxation on income of individuals, taxation on corporate income and taxation on real estates. The first two types of taxes are regulated at national level and therefore are the same across all the country; while taxation on real estates is regulated at municipality level, but official statistics are not available.

## 3.4 Empirical strategy

Since the majority of relocating firms (external relocation) in the sample move within the five metropolitan areas (Krakow, Warsaw, Wroclaw, Lodz, Poznan), the alternatives dataset is composed of the 124 towns in the study area. This implies that the number of observations in the sample decreases to 4785, since 14 firms, which relocated to metropolitan areas from other Polish municipalities, are not considered.

The composition of the firm's choice set cannot be taken for granted. As in previous studies on residential location choice (for example, Kim et al. 2005) or in route choice (among others see Frejinger et al. 2009), the large number of potential alternatives to be included in the choice set makes the estimation procedure computationally unfeasible and behaviourally unrealistic (Lee and Waddell 2010). One practical solution to this problem is to consider a sample of alternatives for model estimation.

Therefore, in the current work, a set of alternatives was randomly sampled for each observation from the complete dataset of 124 municipalities. Firms face 10 alternatives: the first alternative represents the company's current location, while the other nine alternatives are randomly selected as described above. For firms that experienced external relocation in 2008, one of the nine alternatives is the municipality to which they relocated. Firms relocating within the same municipality (internal relocation) are treated similarly to not-relocating firms.

The structure of the choice set allows for modelling the decision-making process as follows: the company chooses to move or not, and, if relocating, chooses the new location.

The model applied is a nested logit (NL) model with two not-overlapping nests (McFadden 1978; Ben-Akiva and Lerman 1985; Manera and Galeotti 2005): Nest1 "Stay" has one alternative (the current municipality) and Nest2 "Move" contains the other nine alternatives.

The NL model belongs to the generalised extreme value (GEV) models and it was developed in order to overcome the problem of correlation among alternatives, which biases the results in a multinomial logit (MNL) model.

These discrete choice models belong to the random utility models family (RUM), in which a decision maker *n* (in our case the firm) chooses among a choice set $C_n = \{1, 2, \dots, i, \dots, J_n\}$ with $J_n$ alternatives (in our case municipalities). The criteria under the choice behaviour is the utility maximisation: the chosen municipality is the one with the highest utility/profits $U_{nj}$ (with $j = 1, \dots, J$) among those in the choice set $C_n$.

The utility $U_{nj}$ is a latent construct that can be described by

$$U_{nj} = V_{nj} + \varepsilon_{nj} \qquad (3.1)$$

where $V_{nj} = V(x_{nj}, s_n)$ is the systematic component, expressed as a function of attributes of municipalities $x_{nj}$ and characteristics of the firm $s_n$; while $\varepsilon_{nj}$ is the random component.

The probability that the firm *n* chooses municipality *i* out of $J_n$ alternatives is given by:

$$P_{ni} = Prob(U_{ni} > U_{nj} \ \forall j \neq i) \qquad (3.2)$$

$$P_{ni} = Prob(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \quad \forall j \neq i) \tag{3.3}$$

For the nested logit models, the error term is distributed as a univariate extreme value (McFadden 1978), allowing for correlations among alternatives belonging to the same nest.

The choice probability for municipality *i* belonging to nest $N_k$is:

$$P_{ni} = \frac{\exp(V_{ni}/\lambda_k)\left[\sum_{j \in N_k} \exp(V_{nj}/\lambda_k)\right]^{\lambda_k - 1}}{\sum_{l=1}^{K}\left[\sum_{j \in N_l} \exp(V_{nj}/\lambda_l)\right]^{\lambda_l - 1}} \tag{3.4}$$

where the structural (logsum) parameter $\lambda_k$ is associated to nest *k*.
(1 - $\lambda_k$) is a measure of the correlation among unobserved factors within nest *k*.
However, since alternatives are sampled from a larger choice set, this may cause a selection bias in the estimates. Following the procedure described by Bierlaire et al. (2008), this bias can be corrected introducing additional parameters ($\omega_i$), which play a role similar to alternative specific constants (ASCs). In this chapter, the systematic part of the utility function $V_{nj}$ includes:

- The advantage of staying in the same municipality, i.e. a sort of firm "inertia", which is captured by the alternative-specific constant of the current municipality alternative.
- The location related factors (see Table 3.2): the signs of the coefficients associated to these variables give information on municipality characteristics attracting companies.
- The characteristics of the firm, in particular the age and sector of the company, which are introduced only in the nest "Move" alternatives. These variables are particularly relevant: they allow controlling for unobserved heterogeneity, avoiding endogeneity problems linked to the use of aggregated data only.
- The distance. Following Bodenmann and Axhausen (2012), this variable is introduced only in the nest "Move" alternatives in a non-linear way, and in particular as a negative exponential function: $\alpha * e^{\phi * distance}$, estimating the parameters α and ϕ.
- The selection bias parameters $\omega_i$. Considering the nest structure described above, eight out of ten $\omega_i$ parameters are identified. Indeed, the parameter $\omega_{ALT1}$ is

confounded with the ASC of alternative one, as it is the sole alternative in the nest "Stay". In the nest "Move", one $\omega_i$ is constrained to zero for identification reasons.

## 3.5 Results and discussion

Table 3.3 shows the results of the estimated nested logit models. Model NL2 represents a robustness check using a different sampling procedure, where the ten alternatives for each firm are drawn from a larger dataset, which is made up of the 124 towns in the study area plus 70 municipalities randomly selected from the rest of Poland. In this model, heterogeneity of the alternatives is higher and we used the entire sample of 4799 observations.

Moreover, models with a choice set with 20 and 60 alternatives randomly drawn have been estimated in order to further assess the robustness of the results. They show that the significance and the sign of the parameters remain unchanged.

Looking at Table 3.3, first we notice that the nested structure applied is always appropriate: the models' parameters associated to the nest "Move" are statistically different from one.

The role of age in influencing firm's choices was frequently underlined in previous studies and the omission of this variable can cause endogeneity problems in the econometric model. Results in both columns confirm the fundamental role of age. Since this variable is individual-specific, we cannot introduce it into the utility functions of the ten alternatives, but we must take one alternative as a reference. In this case, alternative one ("Stay" option) is chosen as the reference. Therefore, the negative sign of the coefficient means that older firms have a lower propensity for moving to other municipalities. This result is in line with previous studies, which underline that younger firms are more mobile (Brower et al. 2004; Strauss-Kahn and Vives 2009; Beckers and Sleutjes 2013; Risselada et al. 2013).

| General information | NL1 (124 m.) | NL2 (194 m.) |
|---|---|---|
| Observations | 4785 | 4799 |
| Initial Log Likelihood | -11015.567 | -11047.803 |
| Final Log Likelihood | -1920.116 | -1984.264 |
| Adjusted rho-square | 0.823 | 0.817 |
| **Utility parameters** | | |
| Age | **-0.374*** (0.02)** | **-0.369*** ** |
| ASC "Stay" | 0.043 (0.17) | 0.0426 |
| Secondary sector | -0.0187 (0.09) | -0.0184 |
| Alpha (distance) | **-0.043*** (0.0006)** | **-0.0426*** ** |
| Phi (distance) | **0.0015*** (00002)** | **0.00158*** ** |
| Protected areas | **-0.003*** (0.0007)** | **-0.00336*** ** |
| Non residential buildings | -0.001 (0.035) | -0.000389 |
| Specialisation | 0.0021 (0.07) | 0.00342 |
| Population density | **0.0005*** (0.0002)** | **0.000196*** ** |
| Core (Nest "Stay") | 0.0097 (0.409) | 0.0114 |
| Core (Nest "Move") | -0.008 (0.43) | -0.00387 |
| Mean monthly salary | -0.00001 (0.0001) | **0.000499*** ** |
| Unemployment | -0.0173 (0.01) | **-0.0376*** ** |
| Municipality expenditure | **0.00012*** (0.00002)** | **0.00017*** ** |
| Special econ. Zone | 0.00317 (0.05) | 0.00175 |
| Entrance motorway | 0.0068 (0.08) | 0.00767 |
| Railway station | 0.0045 (0.04) | 0.00321 |
| Rural municipality | -0.0076 (0.06) | -0.00506 |
| Urban-rural municipality | 0.0025 (0.06) | 0.0034 |
| Krakow m. area | 0.00054 (0.07) | 0.0033 |
| Lodz m. area | -0.0025 (0.08) | 0.00136 |
| Wroclaw m.area | 0.00053 (0.07) | 0.00341 |
| Poznan m.area | 0.0028 (0.07) | 0.00564 |
| Other m.area | - | -0.0151 |
| **Selection bias parameters** | | |
| sb_alt1 | fixed | fixed |
| sb_alt2 | fixed | fixed |
| sb_alt3 | -0.0051 (0.1) | -0.00501 |
| sb_alt4 | -0.0051 (0.1) | -0.00501 |
| sb_alt5 | -0.0052 (0.1) | -0.00502 |
| sb_alt6 | -0.0052 (0.1) | -0.00508 |
| sb_alt7 | -0.005 (0.1) | -0.00492 |
| sb_alt8 | -0.005 (0.1) | -0.00505 |
| sb_alt9 | -0.0051 (0.1) | -0.00506 |
| sb_alt10 | -0.0051 (0.1) | -0.00511 |
| **Model parameters** | | |
| Nest: Stay | 1 - fixed | 1 - fixed |
| Nest: Move | **1.08*** (0.002)** | **1.08*** ** |

Robust std errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 3.3 - Estimation of utility parameters

Figure 3.2 shows the frequency of external relocation depending on firm age. We observe that relocation generally occurs within the first twenty years of business life and, in particular, the frequency is very high within the first ten years.

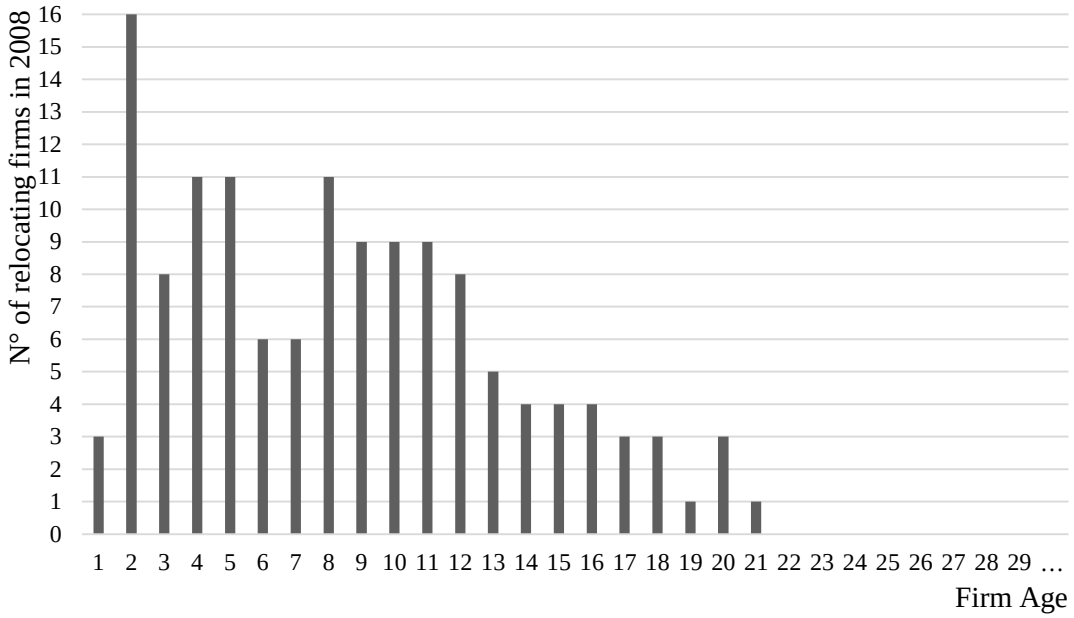


Figure 3.2 - Frequency of external relocation in 2008 depending on firm age

Indeed Esteve-Pérez et al. (2017) highlighted that the first ten years of life are crucial for firms: in order to reduce the risk of failure, they have to innovate (Cefis and Marsili, 2006) and reconsider their products, activities and even their location.
In this context, relocation can be an answer to two alternative necessities of the firm:

1. the need for additional space due to rapid growth (Hoogstra and van Dijk 2004);
2. an attempt in order to survive (the distribution in Figure 3.2 is very similar to the one of the mortality rate depending on firm age: beyond a peak at the beginning in the mortality rate, the risk of failure monotonically declines with firm age (Thornhill and Amit 2012)). This result is confirmed by Esteve-Pérez et al. (2017), which examined the role of firm age in explaining firm survival, using survival analysis. They found that there is a negative relationship

between firm age and the risk of exit/failure, conditional to the phase of the product life cycle.

Since we do not have information on the size of the firm, nor in 2008 nor previously, we cannot verify if the firm lives a growing or a decline phase, therefore we leave to further investigation the aim of establishing which of the two hypothesis identified above describes the situation of the firms in the sample.

Looking at the other results in Table 3.3, the parameters associated to distance (Alpha and Phi) are both statistically significant: the municipality's attractiveness decreases with increasing distance. Given the signs of the coefficients, we find that relocation generates disutility for the firm, within small distance too. This is probably due to the high costs associated to migration. The disutility progressively increases the farther the potential new site is. Indeed, previous studies suggest that firms positively value the proximity to current partners' network, customers, suppliers and employees (Stam 2003).

Looking at the variables that describe the space availability in a municipality, the coefficient of non-residential buildings is not significant, while the one associated to protected areas is significant and negative. This means that the higher the percentage of protected areas in a town (i.e. the lower the space available for business activities), the less a municipality attracts firms.

Urbanisation effects increase the attractiveness of a municipality: the coefficient of population density is statistically significant and positive. This result confirms previous studies' findings: there are positive externalities derived by higher local demand, stronger presence of a skilled workforce and wider supply of local public services and cultural amenities in denser areas (Mameli et al. 2014). High densely populated areas also increase the local market potential, attracting firms to the territory. Regarding the other measure of agglomeration economies (specialisation index), the coefficient is not significant. This is probably due to our data availability, which allows calculating the index only for 1 DIGIT sector. Previous studies found significant results with at least 2 or 3 DIGITS (Beaudry and Schiffauerova 2009).

Finally, the more a municipality spend for education, culture and environmental protection, the higher the attractiveness of this location for entrepreneurs, in line with

previous findings regarding quality of life (Love and Crompton 1999; Badri 2007; Beckers and Sleutjes 2013).

So far, we have described the coefficients that have the same sign and statistical significance across the two models. However, NL2 differs from NL1 model for the coefficients associated to the mean monthly salary and to the unemployment percentage in the municipality.

The coefficient for the mean monthly salary is statistically significant and positive in NL2 model. When compared to other towns in the rest of Poland, the municipalities in the metropolitan areas, which have higher salaries, are preferred by the firms in the sample. Indeed, higher salaries indicate higher education and specialisation of the employees, as well as higher productivity and better amenities in the area (Moretti 2004). In this sense, firms are willing to pay higher salaries (i.e. the urban wage premium, see Yankow 2006) in order to take advantage of availability of highly skilled workers and facilities, hence going into districts where these features are available. However, when firms have to choose only among municipalities in the metropolitan areas, salaries do not play a statistically significant role in firms' preferences (NL1 model). We can conclude that firms do not necessarily adopt a costs minimisation strategy, but they choose municipality where they can maximise profits, thanks to availability of high-skilled workers and amenities.

Another interesting piece of information comes from the coefficient of the unemployment rate, which is statistically significant and negative in NL2 model. This variable was introduced into the model in order to capture the availability of a short-term workforce (in this sense, we expected a positive sign of the coefficient). However, since unemployment is also an indicator of problems in the local economy and presence of low-skilled workforce, this variable turns out to have a negative effect for firms evaluating a location (Bodenmann and Axhausen 2012). Nevertheless, this is true only when firms have to compare the municipalities in the metropolitan areas with other towns in the rest of Poland.

As anticipated in the previous section, we estimate additional parameters, in order to take into account the potential selection bias due to sampling of alternatives. Table 3.3 shows the results for the selection bias parameters: they are not statistically significant.

Moreover, thanks to the likelihood-ratio test, we can say that they are not statistically significant neither singularly nor jointly. Therefore, selection bias does not represent a problem in this analysis.

Finally, we controlled for fixed effects for the five metropolitan areas (Warsaw metropolitan area is taken as a reference), in order to avoid endogeneity problems linked to some intrinsic features that make one region more attractive than the others do. We find that the coefficients of these variables are not statistically significant.

## 3.6 Conclusions

The challenges linked to the emerging new global trends induce businesses to a continuous adjustment process. In particular, the choice of the location appears to be one of the most strategically relevant decision. If we consider that firms constantly monitor market competitiveness and compare their location with others, the location choice can be seen as a dynamic and continuous process of optimisation, which could also imply relocation at a certain point in time. This kind of process is particularly important during the first crucial years of business activity. In this context, relocation can be seen as a chance to evolve and survive, or to find appropriate new spaces in order to deal with a rapid internal employment growth.

The main goal of this chapter is to study how company and territory characteristics influence the destination decision of relocating firms within five Polish metropolitan areas. Using micro data, we apply a nested logit model with sampling of alternatives, in order to analyse relocation factors.

Previous studies have underlined the complexity of the firm relocation process: causes and consequences of migration are multiple and often interconnected. So far, this topic has been mainly investigated on an aggregate level. However, not considering firms' individual information, these studies risk to incur in endogeneity problems due to unobserved heterogeneity. One of the strength of the current analysis is to take into account firms' characteristics. Results support their fundamental role in explaining firms' behaviour and preferences.

The econometric analysis shows that both characteristics of companies and features of the municipalities affect the destination choice. In particular, we observe that, when migrating, firms prefer locations within shorter distances and older firms show a lower propensity for moving to other municipalities. Our results demonstrate the relevance of urbanisation economies and availability of space in the locational preferences of firms. Municipalities with few areas where it is prohibited to build, high local demand, strong presence of skilled workforce and wide supply of local public services and cultural amenities are preferred. Moreover, we find that firms are willing to pay higher salaries in order to take advantage of the dynamic economic environment of metropolitan areas.

Since it is unrealistic that companies evaluate hundreds of locations when deciding to relocate, we consider a sample of alternatives for model estimation. This procedure is seen to be appropriate for the purposes of the analysis and robust to the different sampling procedures applied. Results show that selection bias does not represent a problem in this analysis.

There are limits to the current study. As anticipated above, we do not take into account firms that decided to leave the considered metropolitan areas to go elsewhere. Another issue regards the unexplained heterogeneity linked to the size (i.e. number of workers) of the firm. Future research should try to recover this information, since previous studies have underlined the relevant role of this characteristic in influencing firms' behaviour (De Bok and Sanders 2005; Sleutjes and Beckers 2013; Nguyen et al. 2013). Finally, the analysis should be extended both to firms located in polycentric metropolitan areas and to a longer period, in order to investigate respectively the possible differences among the two types of metropolitan area and the dynamic nature of the relocation process.

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# Conclusions

As underlined by a growing amount of economic literature, the space/geography should be taken into account when studying the behaviour of economic actors, especially firms. In particular, the study of phenomena at the regional level is assuming an increasingly relevant role in the debate, both for understanding the competitive behaviour of firms at micro level and the derived policy implications.

The thesis proposes three essays on firms' location-related behaviour, focusing on two strategic issues: business travel plans and relocation choices. The two concepts are partially related: both concern how firms interact with the territory. The location of the firm is a crucial strategic decision: business travels enable the firm to create contacts and links within the territory, while the relocation decision comes from the inadequacy of the territory to satisfy the evolving needs of the firm or from other locations offering better outlooks and opportunities.

One of the strengths of the thesis is the use of firms' individual data across all three chapters. Indeed, thanks to micro data, we avoid problems which may be caused by unobserved heterogeneity.

The first chapter investigates how improved accessibility influences the business relations among firms. We analyse the case of Ticino, which will benefit from the building of the high-speed railway line called AlpTransit that will link Lugano with the north of the Alps in less than two hours by the end of 2020.

While most of the past studies are ex-post evaluations of the impact of an infrastructure, the aim of this analysis is to offer an ex-ante evaluation of the AlpTransit project, using individual firm level data. In order to do this, we rely on the stated preference methods, which allow taking into account hypothetical behaviours in the future. Therefore, we presented a questionnaire to a sample of firms located in Ticino, in order to collect data on changes in business visits after AlpTransit.

The probability that face-to-face contacts will increase after AlpTransit is analysed by distinguishing employee categories: CEO and upper management, administrative staff, sales personnel and specialists. This specification helps in identifying the probable

meeting purpose, for example visiting clients, branches, government departments or attending courses, fairs, etc. Moreover, not all workers in a firm travel: professional status and hierarchical position are significant factors which influence the business travel characteristics.

Estimating four ordered logit models, we obtain differentiated results among employees with different functions in various types of firms. Results show that a difference among employee categories in the propensity to increase business travel after AlpTransit exists. Moreover, firms that operate in business services have a higher propensity for increasing face-to-face contacts. In particular, we observe that the existence of common clusters in two regions encourages the development of business relations across firms. Another interesting piece of evidence from the study is that a firm's current level of business travel between Ticino and Zurich encourages future face-to-face contacts. We conclude that business travel habits influence future ones, reinforced by interaction effects among higher and lower levels of employee categories.

Therefore, the first chapter of the thesis contributes to the literature by demonstrating that it is possible to identify future adaptation of business travel at individual firm level due to improved accessibility, while previous studies analysed implications on regional development of infrastructure projects only on an aggregate level.

The second and the third chapters investigate two aspects of the relocation behaviour of firms, using different types of data.

In particular, the second chapter seeks to disentangle the influence of company and territory characteristics on firms' propensity to leave their current location in Ticino in the near future. Our main purpose is to study whether and how this probability changes if some hypothetical external shocks occur. Two hypothetical scenarios are taken into account: an appreciation of the Swiss Franc and changes in the bilateral agreements between Switzerland and the European Union, introducing considerable restrictions to the free movement of people and goods. As far as we know, this is the first attempt to study how relocation behaviour changes among different scenarios with external hypothetical shocks, using the stated preference methods. Data were collected with an online survey

among Ticino firms and, thanks to the estimation of ordered logit models, we obtained specific results for each scenario.

Empirical results support our hypothesis that different scenarios actually have different impacts on the relocation probability. We therefore provide new evidence that economic and institutional policies, which could change the environment where the firm operates, influence relocation behaviour. Moreover, results highlight that the location and the intensity of commercial linkages, and in particular of customers, is an essential determinant of the location and relocation choices: businesses with a local market have no interest in leaving the territory, even if some shocks damage the entire economy.

The last chapter of the thesis investigates the influence of different driving factors on destination choice for relocating firms within Polish metropolitan areas by studying the preferences of firms having different characteristics, using revealed preference data.

In order to model the relocation choice and the destination decision of firms, we apply a nested logit model with sampling of alternatives, since it is unrealistic that companies evaluate hundreds of locations when deciding to relocate. This procedure has not yet been applied in the context of relocation choices of firms, and is seen to be appropriate for the purposes of the analysis and robust to the different sampling procedures considered.

Results show the relevance of urbanisation economies and availability of space in the locational preferences of firms. Municipalities with few areas where it is prohibited to build, high local demand, strong presence of skilled workforce and wide supply of local public services and cultural amenities are preferred. Moreover, we observe that, when migrating, firms prefer locations within shorter distances.

Finally, we provide new empirical evidence on the crucial role of firm's characteristics in influencing the relocation decisions, in particular concerning the role of a firm's age in determining relocation decisions. Results highlight that older firms show a lower propensity for moving, while the location change can represent an opportunity for young firms to grow, evolve and survive.

Two main directions characterise the plans for future research: acquire new revealed preference data and extend the period of observation to more than one year.

Regarding the first and the second chapter of the thesis, whose analyses are based on stated preference data, the ambition is to collect revealed preference information on both actual business travels and relocation decisions of firms. In particular, future research will have to verify our findings for Ticino after the opening of AlpTransit, and include an equivalent approach to the analysis of behaviour of Zurich firms. After all, given the "double importance" of accessibility, Ticino will also be closer for Zurich firms. Moreover, the analysis should monitor the potential plant movements of firms which participated in the survey, and eventually explore the relocation motivations by means of interviews. Finally, concerning the third chapter, future studies should extend the analysis to a longer period in order to more deeply investigate the dynamic nature of the relocation processes.